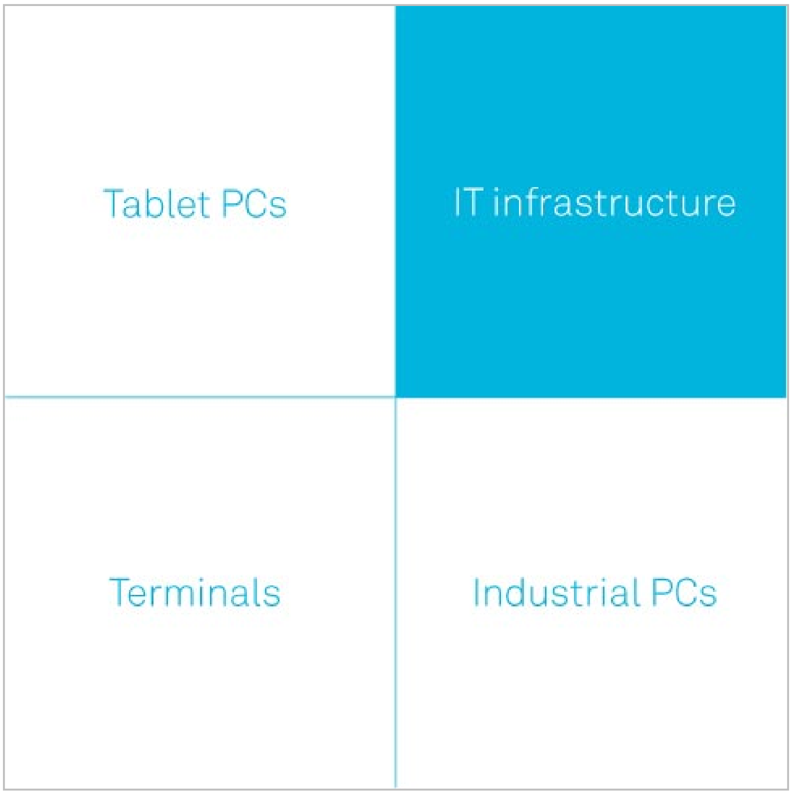
Version 4.2

User Manual

IT Infrastructure
RAP/RAC1000

the rugged world of IT®

Product Portfolio



Tablet PCs

IT infrastructure

Terminals

Industrial PCs

HIGH RISK APPLICATION HAZARD NOTICE

Unless otherwise stated in the product documentation, the device is not provided with error-tolerance capabilities and cannot therefore be deemed as being engineered, manufactured or setup to be compliant for implementation or for resale as an online surveillance device in environments requiring safe, error-free performance, e.g. for implementation in nuclear power plants, aircraft navigation, communication systems, or air traffic control, life saving and military facilities whereby possible device failures might result in death, personal injuries, or serious physical and/or environmental damages (i.e. all applications involving high-risk hazard factors). This is therefore to state that neither ads-tec nor any ads-tec sub-supplier do not hereby undertake any warranty of fitness and/or liability whatsoever, be it by express or by tacit consent, in as far as the suitability of the Firewall to high-risk application hazards is concerned.

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About us

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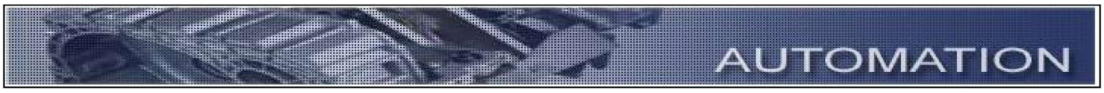
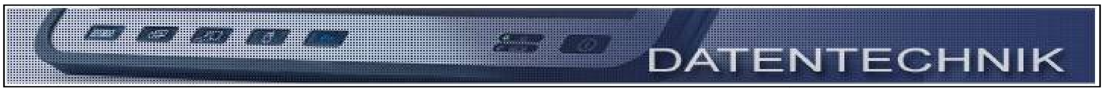
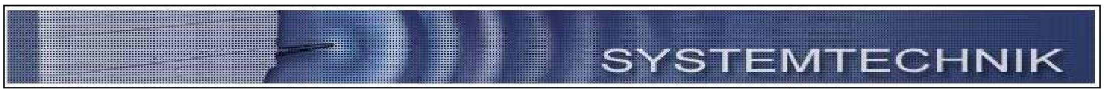
ads-tec GmbH provides large enterprises and globally active corporations with cutting edge technology, up-to-date know-how and comprehensive services in the area of automation technology, data processing technology and systems engineering.



ads-tec GmbH implements full automation solutions from planning to commissioning and is specialized in handling and material handling technologies.



The data systems division develops and produces PC based solutions and offers a broad range of industrial PCs, thin clients and embedded systems.



ads-tec is specialized in modifying and optimizing embedded operating systems and develops software tools to complement its hardware platforms.

1 Notes

1.1 Relevant Unit Documentation

The following documents are essential to unit setup and operation:

User Manual (this document)

Contains information on mounting, placing into operation and operation of the unit, further to technical data on unit hardware.

Service CD:

Contains the User Manual, the Assembly Guide, the Quick Install Guide and Tools.

1.2 Description of the warning symbols used in this guide

Warning:

The "Warning" symbol precedes warnings on uses or operations that might either lead to personal injury and/or hazards, or to any hardware and software damages.

Note:

This Symbol indicates special notes, terms and/or conditions that strictly need to be observed to ensure optimised and/or zero-defect operations. It also precedes tips and suggestions for efficient unit implementation and software optimisation.

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Any violation and infringement thereto will be held liable for compensation of all damages.

1.6 STANDARDS

This unit is compliant with the provisions and safety objectives of the following EU Directives:

- This unit is compliant with the CE mark testing specification limits as defined in the European test standards EN 61000-6-4 und EN 61000-6-2
- This unit is compliant to the DIN EN 60950 (VDE0805, IEC950) testing specification limits on "Safety of Information Technology Equipment"
- This unit is compliant to the DIN EN 60068-2-6 (sinusoidal vibration) testing specification limits
- This unit is compliant to the DIN EN 60068-2-27 (shock and bump) testing specification limits

➔

Note:

A corresponding declaration of conformity is available for competent authorities, care of the Manufacturer. Said declaration can be viewed at all times upon request.

For full compliance to the legal requirements in force on electromagnetic compatibility, all components and cables used for unit connection must also be compliant with said regulations. It is therefore necessary to employ BUS and LAN cables featuring screened plug connectors, to be strictly installed as per the instructions contained in the User Manual.

2 Operating and Safety Instructions

The unit operates under electrical tension and implements supersensitive component parts. Intervention by the User is required only for power supply line connection operations. Should any further alterations be required, it is necessary to consult either with the Manufacturer directly or with authorised service personnel accordingly. During said connection operations, the unit must be completely powered down. Specific requirements need to be met concerning the prevention of electrostatic discharge on component construction parts during contact. If the unit is opened up by a non authorised individual, the User may be subject to potential hazards and, warranty conditions are terminated.

General Instructions:

- This User's Guide must be read and understood by all Uses and must be available for consultation at all times
- Mounting, operation start-up and unit operation must only be conducted by appropriately qualified and trained personnel
- All individuals and operators using the unit must strictly observe all safety and use instructions as provided within the User's Guide
- All regulations and prescriptions on accident prevention and safety in force at the unit installation site must be strictly observed at all times
- This User's Guide provides all the most important directions as required for safe and security oriented operation
- Safe and optimised unit operations are subject to appropriate storage, proper transport and handling, accurate unit setup, start-up and operation

Note:
Only original ads-tec firmware / software is allowed for any of the adjustments and features described in this User's Guide. Deployment of any firmware / software that has not been released by ads-tec will terminate all warranty conditions.

2.1 Safety Instructions

Warning:
In order to prevent possible unit damages, all cable lines (power supply, interface cables) must be hooked up strictly with the unit in power-OFF conditions.

Warning:
All unit mounting operations must be strictly conducted under safe, secure and zero-potential conditions.

Note:
When handling parts and components susceptible to electrical discharge, please accurately observe all the relevant safety provisions.

(DIN EN 61340-5-1 / DIN EN 61340-5-2)

2.2 Unit Operation Site

This unit is engineered for industrial application. It is necessary to ensure that specified environmental conditions are maintained at all times. Unit implementation in non-specified surroundings, i.e. onboard ships, in explosive atmospheres or at extreme heights, is prohibited.

Warning:

For the prevention of water condensate accumulation, the unit should be turned ON only when it reaches ambient temperature. This particularly applies when the unit is subject to extreme temperature fluctuations and/or variations.

Avoid overheating during unit operations; the unit must not be exposed to direct sunlight or any other direct light or heat sources.

Warning:

This is a Class A device. In a domestic environment this device may cause radio frequency (RF) interference, in which case the user may be required to take adequate measures.

Warning:

If the unit is operated in outdoor locations, a lightning conductor needs to be present within capture range. Ensure that all incoming conductive systems are equipped with equipotential bonding.

2.3 Damages due to improper Use

Should the service system have evident signs of damages incurred e.g. due to wrong operation or storage conditions or due to improper unit use, the unit must be decommissioned or scrapped. Ensure that it is protected against accidental start-up.

2.4 Warranty / Repairs

During the unit warranty period, any repairs thereto must strictly be conducted solely by the manufacturer or by service personnel that has been duly authorised by the manufacturer.

2.5 General Directions for the 5GHz Version (802.11 a / 802.11 h) ETSI

- The unit is certified for use of the 5 GHz band in accordance with ETSI EN 301 893 V1.3.1. Users need to observe the following:
- Access Point as well as Access Client units make use of DFS and TPC as standard on all 5 GHz channels, in indoor as well as in outdoor configuration. This means that the devices may always be operated at a maximum transmission power of 23 dBm or 30 dBm, respectively.

Note:

Access Points must not switch off DFS in outdoor locations. Access Clients may switch off DFS, though. This setting is turned off by default.

- 802.11a channels cannot be set to static values.

Note:

The lower 4 channels (non-DFS) can be set to static values if DFS is turned off. Turning off DFS will however also make the features 60s Scan and Radar Detection unavailable.

- When activating the Access Point, the unit will perform an initial Radar Detection Scan during which it will wait 60 seconds for a radar impulse on a randomly chosen channel. Subsequently, it will start operating on this channel.
- If an Access Client detects a radar impulse during operation, the Access Point will be notified of this via 802.11h. Triggered by this or its own detection of the impulse, the Access Point will subsequently perform a channel switch to 802.11h. The connection loss in this case is usually less than 80ms.
- The maximum permissible transmission power is different for each channel. Hence users are required to correctly set the antenna amplification in case the standard antenna is replaced!

2.6 Antenna List for use in USA and Canada / FCC

- This antenna types can be used with the Access Points and Access Client in USA and Canada. The antennas can be ordered at ads-tec GmbH. For the correct operation you have to use an absorbability cabel for the different antenna types.

Ads-tec part number	Ads-tec part description	Antenna type	Frequency band	Gain	absorbability
DZ-PCKO-11032-0	RAP Antenne 2,4 GHz SMA-R 5dBi	Swivel	2,4 ~ 2,4835 GHz	5 dBi	none
DZ-PCKO-11033-0	RAP Antenne 5 GHz SMA-R 7dBi	Swivel	5,1 ~ 5,835 GHz	7 dBi	none
DZ-PCKO-11034-0	RAP Antenne 2,4 GHz N-fem. 9 dBi	Omni	2,4 ~ 2,4835 GHz	9 dBi	none
DZ-PCKO-11034-1	RAP Antenne 2,4 GHz N-fem. 12 dBi	Omni	2,4 ~ 2,4835 GHz	12 dBi	none
DZ-PCKO-11035-0	RAP Antenne 2,4 GHz N-fem. 12 dBi	Panel	2,4 ~ 2,4835 GHz	12 dBi	none
DZ-PCKO-11035-1	RAP Antenne 2,4 GHz N-fem. 18 dBi	Panel	2,4 ~ 2,4835 GHz	18 dBi	minimum 20m (it is a Ecoflex10*^{1} cable to use)
DZ-PCKO-11036-0	RAP Antenne 5 GHz N-fem. 12 dBi	Omni	5,1 ~ 5,835 GHz	12 dBi	minimum 14m (it is a Ecoflex10*^{1} cable to use)
DZ-PCKO-11037-0	RAP Antenne 5 GHz N-fem. 12 dBi	Panel	5,1 ~ 5,835 GHz	12 dBi	minimum 20m (it is a Ecoflex10*^{1} cable to use)
DZ-PCKO-11037-1	RAP Antenne 5 GHz N-fem. 20 dBi	Panel	5,1 ~ 5,835 GHz	20 dBi	minimum 37m (it is a Ecoflex10*^{1} cable to use)

*^{1} It has at 2,4GHz 22.5dB/100m absorbability and at 5GHz 35.9dB/100m absorbability. Additional every plug has 0.5dB absorbability.

Warning:

Behalf of the correct operation you have use an absorbability element for the different antenna types.

Note:

Also light wave conductor cable can be used. It is necessary to use terminating impedance for the correct use.

2.7 Channel List for use in USA and Canada / FCC

- The following List showes the pool of available frequency and channles for the use in USA and Canada. The customer can define between Indoor and Outdoor use. This option can be selected by a checkbox in the web interface.

Frequency	Channel	Indoor use	Outdoor use
2,4 GHz (2.400~2.483GHz)	1 – 11	X	X
5 GHz (5.18~5.24GHz)	36,40,42,44,48	X	
5 GHz (5.725~5.825GHz)	149 ,153,157,161,165	X	
5 GHz (5.725~5.825GHz)	149 ,153,157,161,165		X

2.8 WLAN Instructions

Warning:

These warnings need to be observed during operation:

- *The unit does not provide a „secure" transmission medium*
- *The units cannot be used to establish a real-time system*
- *The units' system behaviour is non-deterministic*
- *MIN/MAX roaming period is not guaranteed*

Setting the applicable regulatory authority as well as the respective antenna amplification is solely the responsibility of the operator.

3 Introduction

Reliable, stable and secure wireless LAN connections: employing state-of-the-art technology, the industrial Rugged Access Point (RAP) provides *the* network interface for a variety of applications, such as commissioning, mobile computing and data communication. The RAP supports all applicable standards, including 802.11a/b/g, at a transmission frequency of 2.4 and 5 GHz. Industrial applications necessitate sturdy technology. Whether installed in a cold store or in great heat – thanks to its extended temperature range, the RAP continues to function. Furthermore, the RAP is MIL-certified, which means it passed one of the most demanding shock and vibration tests – this guarantees utmost ruggedness.

Note:

In Case of Updates, it is possible that external Hyperlinks, which are used in this Documentation, will not work properly or may be available under a different Hyperlink.The Company ads-tec (also "ads-tec") does not take over any kind of warranty or adhesion for the functionality of Hyperlinks. Furthermore, ads tec does not take over any kind of warranty or adhesion regarding the installation, use and the accuracy of all open SOURCE software.

Note:

*For the efficient online configuration of your ads tec devices, it is possible to download the current version of the free Tool „**IDA light** "on the company`s homepage **http://www.ads-tec.de**. The Tool offers you for example the possibility of defining individual parameters or whole groups of parameters at a master device and to transfer your settings to a limited selection and/or to all ads tec devices of same design and version, without having to make these configurations time-consuming at each individual device. You also have the possibility of assigning sequential IP addresses for your ads tec devices.*
With IDA light you can provide comfortably own groups of parameters according to your specific requirements and modify them at any time.

Note:

This documentation always refers to both Access Point and Access Client, unless explicitly stated otherwise.

3.1 RAP AND RAC VERSIONS

		RAP – Rugged Access Point											
		RAP1000 series											
		RAP 1110	RAP 1111	RAP 1210	RAP 1211	RAP 1120	RAP 1121	RAP 1220	RAP 1221	RAP 1510	RAP 1511	RAP 1520	RAP 1521
Radio modules	1 WLAN module	x	x	x	x					x	x		
	2 WLAN module s					x	x	x	x			x	x
Ports	1x Cu-RJ45 port	x	x			x	x			x	x	x	x
	4x Cu-RJ45 port (switch)									x	x	x	x
	1x fibreoptic Ethernet port			x	x			x	x				
Power supply	24 V DC	x	x	x	x	x	x	x	x	x	x	x	x
	AC integrated 110/230 V		x		x		x		x		x		x
	Redundant energy supply	x	x		x	x	x		x	x	x	x	x
Client mode	RAP incl. client mode	x	x	x	x	x	x	x	x	x	x	x	x
	Seamless Roaming Client*					x	x	x	x			x	x

		RAC – Rugged Access Client					
		RAC1000 series				RAC2000 series	
		RAC 1120	RAC 1121	RAC 1220	RAC 1221	RAC 2110	RAC 2120
Radio modules	1 WLAN module					x	
	2 WLAN modules	x	x	x	x		x
Ports	1x Cu-RJ45 port	x	x			x	x
	4x Cu-RJ45 port (switch)						
	1x fibreoptic Ethernet port			x	x		
Power supply	24 V DC	x	x	x	x	x**	x**
	AC integrated 110/230 V		x		x		
	Redundant energy supply	x	x		x		
Client mode	RAP incl. client mode						
	Seamless Roaming Client*	x	x	x	x		x

* Seamless Roaming Clients: From access point to access point without any packet loss or interruption of data transmission
**12 – 24V

RJ45 (Registered Jack 45 = standardised jack) is an Ethernet standard frequently used in telecommunication applications. Transmission method is equivalent to 10/100Mbits half & full DUPLEX 100 BASE-TX.

Optical fibres are flexible optic media for controlled conduction of light. Contrarily to the Ethernet standard, the fibre optic connection technology is insensitive to voltage interference.

The plugs required for implementation are equivalent to the MTRJ Standard Multimode with a 100Base-FX 100 Mbit/s Ethernet transmission via fibre optics.

3.2 Scope of Supply

Package contents need to be checked for integrity and completeness:

- 1 device
- 1 x two-pole COMBICON plugs (in case of 24V DC devices)
  Manufacturer: Phoenix Contact
  Item description/item short text: FMC 1,5 / 2-STF-3,5
- 1 x three-pole COMBICON plugs (in case of 230V AC devices)
  Manufacturer: Phoenix Contact
  Item description/item short text: MC 1,5 / 3-ST1F-5,08
- Four or eight antennas (depending on variant)
- Grommets / blanking plugs
- Installation kit with mounting plate and fasteners (fixed to device)
- Quick Install Guide / Quick Mount Guide
- GNU General Public License
- Service CD

3.3 Environmental Conditions

The unit can be put into operation and used under the following conditions. Failure to observe any one of the specified data will immediately terminate all warranty conditions. ads-tec cannot be held liable for any damages arising due to improper device or unit use and handling.

- Permissible ambient temperature

during operation	from -20 … 55° C
during storage	from -20 … 55° C

- Humidity

during operation	10 to 85%, without condensate
during storage	10 to 85%, without condensate

- Vibration

during operation	1 G, 10 to 500 Hz (DIN EN 60068-2-6)
Vibration certificate:	MIL-STD-810F 514.5 C-2 5 to 500 Hz (01-01-2000)

- Shock

during operation	5 g, with a 30 ms half-cycle (DIN EN 60068-2-29)

4 Mounting

4.1 Mounting Conditions

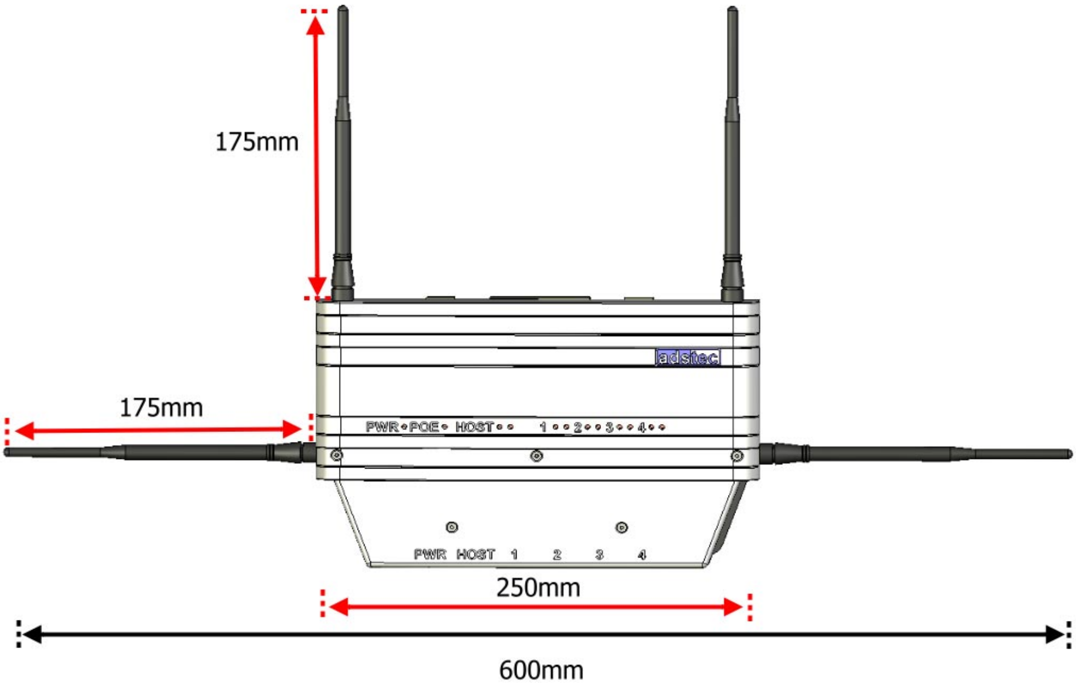
The device is designed for industrial operations and may be employed wherever the environment conditions specified above are met. In order to ensure optimal mounting and operation, the unit should be placed at suitable location at which WLAN connectivity is not impaired. WLAN connectivity is adversely influenced by iron beams and thick concrete walls.

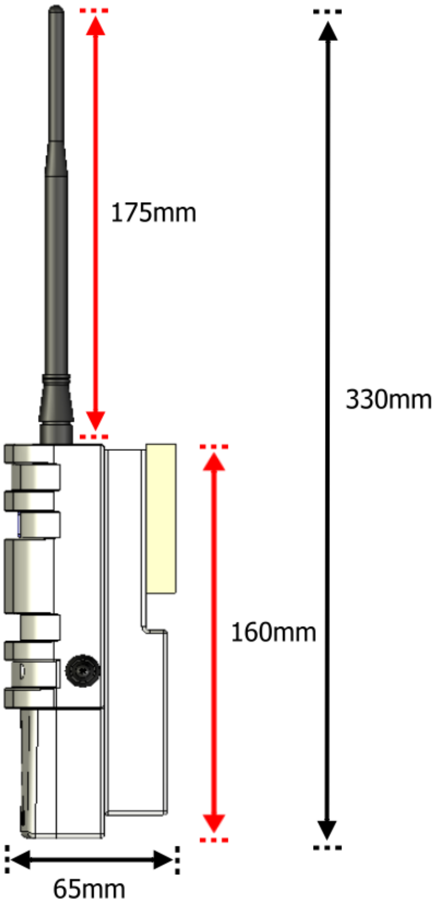
4.2 Exterior Device Dimensions

Height: 160 mm (w/o antenna)

Width: 250 mm (w/o antenna)

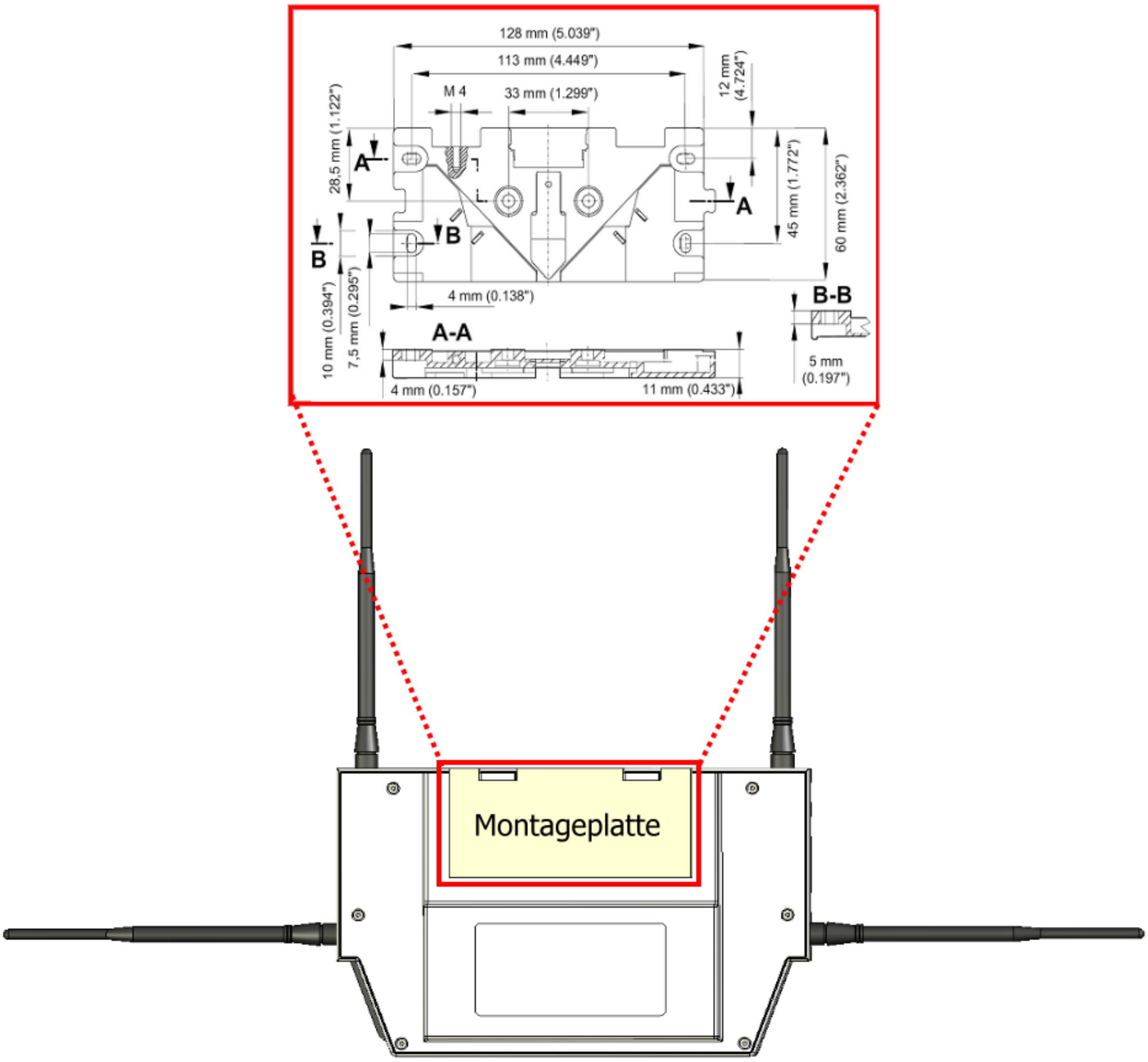
Depth: 65 mm (w/o antenna)




175mm
330mm
160mm
65mm

4.3 Mounting Diagram

> ***Note:***
> *The mounting diagram shown herein is not 1:1 scale.*
> *Please refer to the Quick Install Guide for a 1:1 scale diagram.*

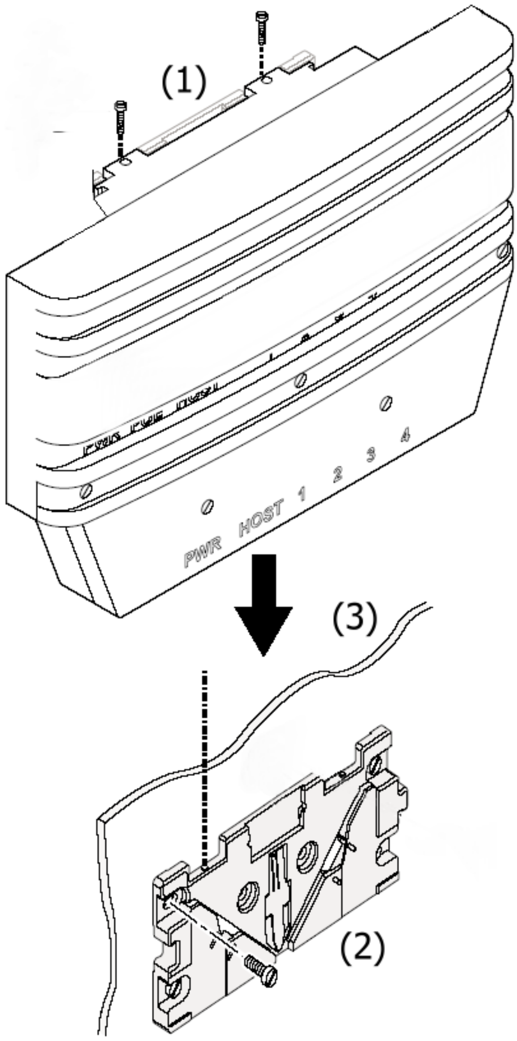


4.4 Device Mounting

The mounting plate is pre-mounted to the device when delivered to the customer.

1) To install the device in the desired location, loosen the Allen screws (M4x12). **(1)**

2) Fix the mounting plate (w/o device) in the desired location. Ensure that the plate is held by at least two opposing screws. **(2)**



3) Place the device onto the mounted fixture and make sure that device and fixture are flush with each other. **(3)**

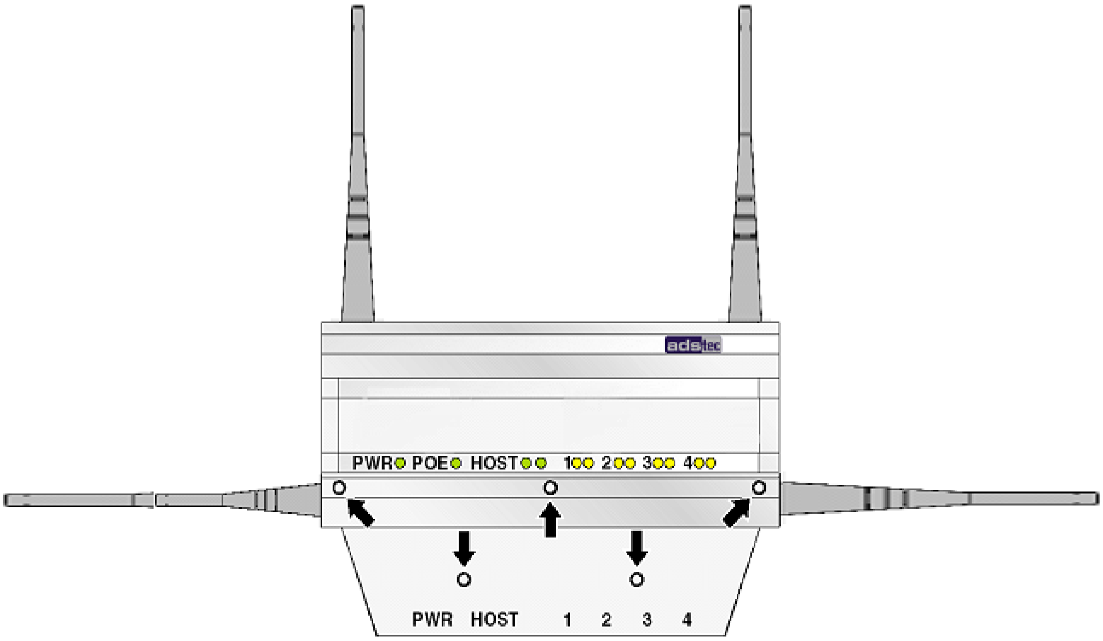
4) Secure the device inside the fixture using the previously removed Allen screws. **(1)**

➔ ***Note:***
Please ensure that the device is not mounted behind or next to another object as this may impair the unit’s transmission performance and connectivity.

4.5 Connecting Supply Lines

The supply connection, as well as device interfaces, is located inside the unit. The maintenance duct cover needs to be removed before supply lines and interface cables can be connected.

Please remove the five screws (M3x8) indicated below.



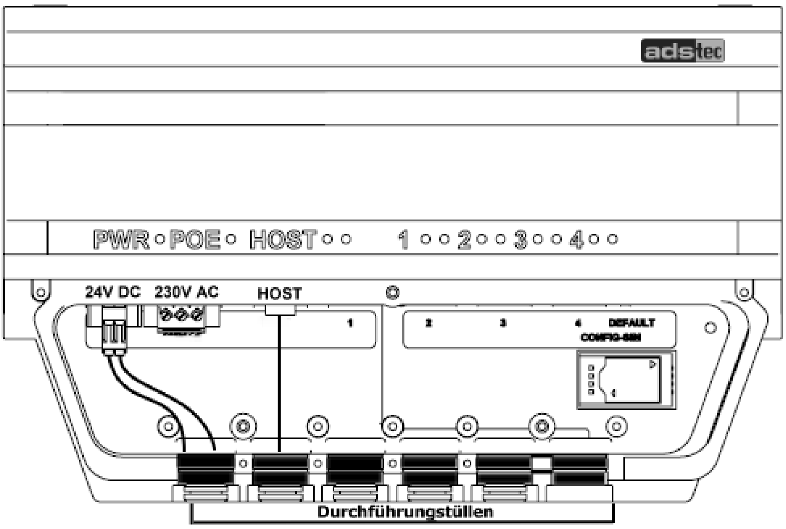
Warning:

To avoid damage to the unit's electronics, switch off the device before establishing or removing any plug connections.

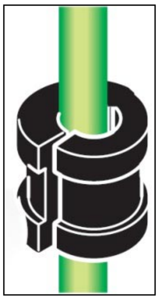
Observe permissible device voltage.

Once the maintenance duct cover has been removed, the supply lines can be connected to the device.

The diagram shows an exemplary device configuration with 24V DC power supply and host line.



To ensure IP65 protection all supply lines need to be fitted with suitable grommets.



Note:

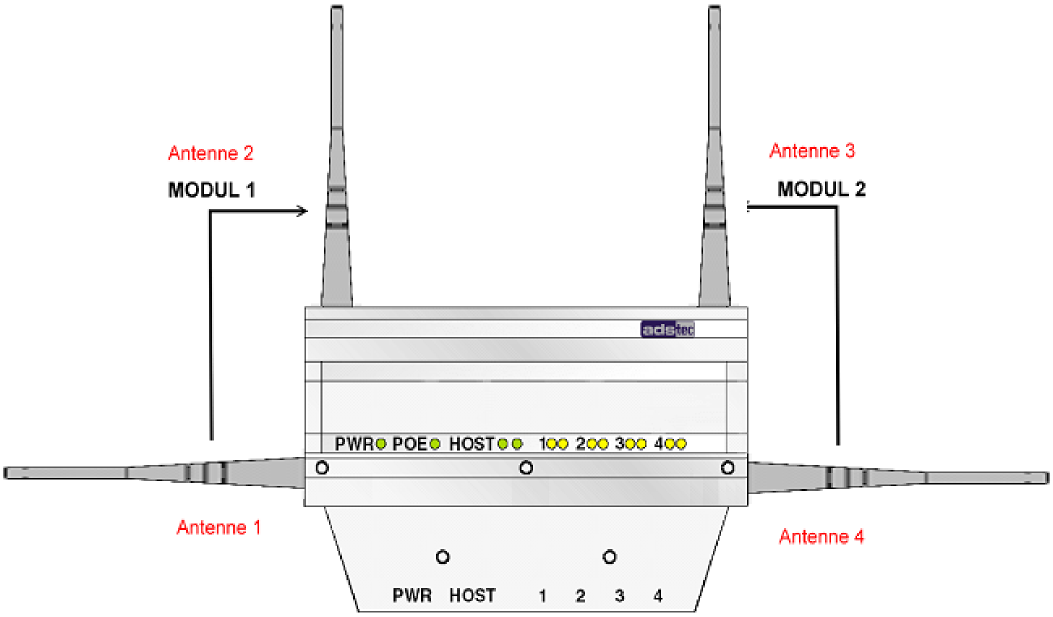
Grommet sizes need to be chosen in accordance with the respective cable diameters.

Once the grommets have been placed around the cables, they need to be placed into the intended slots.

Finally, put the maintenance duct cover back onto the device and screw it down with the five screws removed previously.

4.6 ANTENNA ASSEMBLY

For each WLAN module, 2 antennas should be installed.



Depending on the device variant, the unit accommodates up to two radio modules for two separate WLANs. The full antenna assembly for each module consists of one vertical and one horizontal antenna. The four or eight antennas supplied work at a frequency of 2.5GHz or 5Ghz (two or four each, respectively).

Screw the antennas onto the antenna connectors.

5 System Features

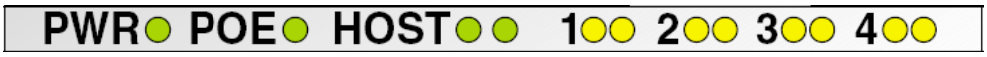
5.1 LED Status Indicators

The device is fitted with LEDs that indicate the status of the respective interfaces. This facilitates an on-site status diagnosis of the Access Point/Client. The following overview explains the different states of the LED indicators:

Legend

LED status	Shown in table as
off	□
green	🟩
green, flashing	◧
ret	🟥
orange	🟧
orange, flashing	◧

Power Supply / HOST / Switch



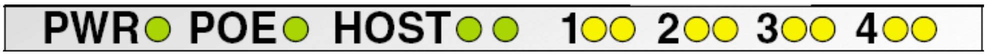
Power	**Status**	**Description**
PWR	□	No power supply.
PWR	🟩	Device connected to power supply and ready for use.
HOST		
Left LED LINK	□	Interface not connected to remote station.
Left LED LINK	🟩	Interface connected to remote station and ready for use.
Right LED ACT	□	No data transfer between device and remote station.
Right LED ACT	◧	Indicates data transfer between device and remote station.

Switch 1 / 2 / 3 / 4		
Left LED LINK	□	Interface not connected to remote station.
Left LED LINK	🟩	Interface connected to remote station and ready for use.
Right LED ACT	□	No data transfer between device and remote station.
Right LED ACT	◧	Indicates data transfer between device and remote station.

5.2 LED Status Indicators during Operation

Behaviour of Status Indicators during Boot Sequence

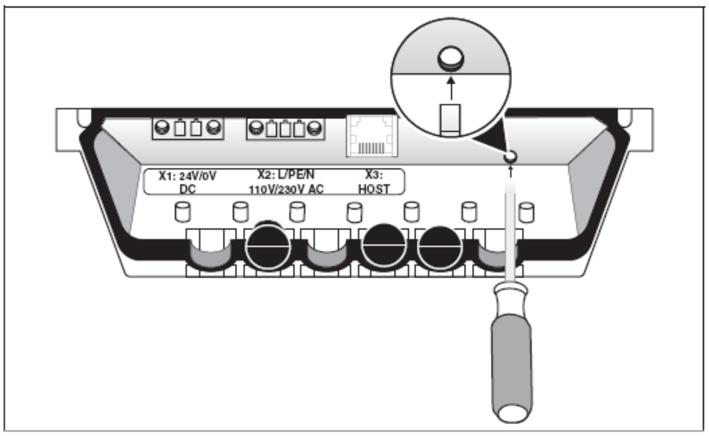
The boot sequence is initiated as soon as the Access Point / Client is connected to a power supply. The **HOST** indicator LEDs can be used to monitor the boot sequence. Please refer to the following overview to verify the device boots correctly. The overview assumes that no cable is connected to **HOST**.



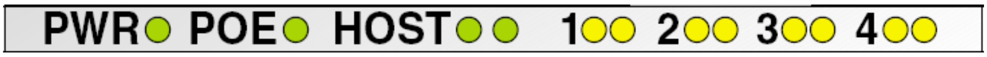
PWR	**Status**	**Description**
L+	🟩	Device is connected to power supply via POWER and ready for use.
HOST		
LINK / ACT	◧ ◧	LEDs flash briefly once
	◧	LED flashes slowly, then quickly (20x)
	□	LED extinguished

BEHAVIOUR OR STATUS INDICATORS DURING RESET TO DEFAULT SETTINGS

The reset button located under the interface cover may be used to reset the Access Point / Client to factory default settings at any time and without regard to the current device configuration.



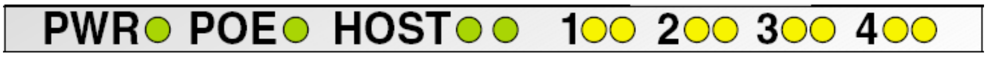
To reset device to default settings, press reset button and switch on the device. Keep reset button pressed for approx. 20 seconds. Button may be released as soon as left HOST indicator LED turns green. The following overview assumes that no cable is connected to **HOST**. Please refer to the overview to monitor the reset to factory defaults.



PWR	STATUS	DESCRIPTION
L+	🟩	Device is connected to power supply via POWER and ready for use.
HOST		
LINK / ACT	🟩 🟧	LEDS FLASH CONTINUOUSLY
LINK / ACT	□ □	LEDS EXTINGUISHED

Behaviour of Status Indicators during Firmware Update

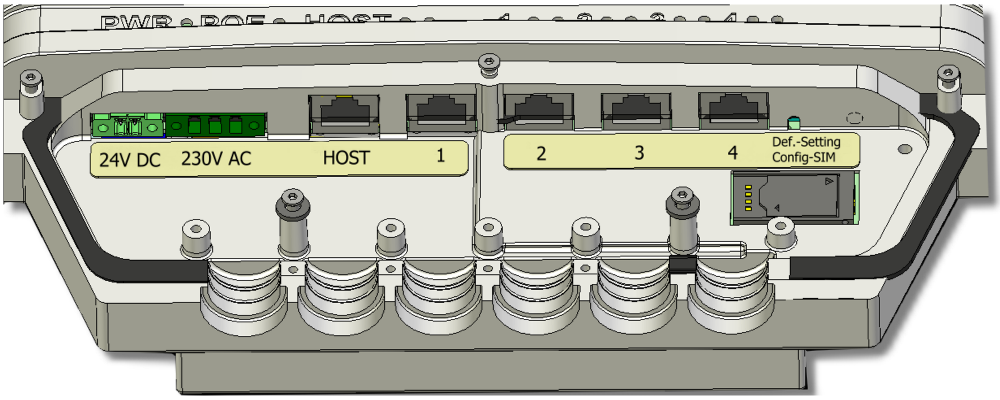
The web interface can be used to perform firmware updates. Once initiated, the actual update may take several minutes to complete. Please refer to the following overview to monitor the firmware update sequence.



PWR	**Status**	**Description**
L+	🟩	Device is connected to power supply via POWER and ready for use.
HOST		
LINK / ACT	◧ ◧	LEDs flash quickly
LINK / ACT	□ ◧	LINK extinguished / Act flashes
LINK / ACT	🟩 □	LINK lit up / ACT extinguished
LINK / ACT	🟩 ◧	LINK lit up / ACT flashes slowly
LINK / ACT	🟩 ◧	LINK lit up / ACT flashes quickly
LINK / ACT	🟩 □	LINK lit up / ACT extinguished
The web interface may subsequently be started by selecting “Try to Reconnect”		

5.3 Interface Overview

The following figure shows the available device interfaces. The exact interfaces may differ depending on the device variant.



The device is equipped with the following interfaces:

1. Power 24V DC power supply (two-pole COMBICON plug)
2. Power 230V AC power supply (three-pole COMBICON plug)
3. HOST RJ45 or Optical connector
4. SWITCH 4x RJ45 connector (optional feature for Access Client)
5. Default reset button
6. SIM card reader

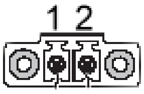
➔

Note:
Input voltages may be connected redundantly (i.e. Power 24V DC, Power 230V AC).

5.3.1 Power Supply 24V DC

A bushing terminal with threaded connector is used to establish the power supply connection (diagram shows bushing inside device).

PIN NUMBER	SIGNAL NAME
1	24V DC
2	0V DC

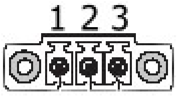


PIN 1: = L+ 24V DC power supply
PIN 2: = GND Ground

5.3.2 Power Supply 110/230 VAC

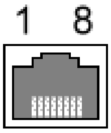
A bushing terminal with threaded connector is used to establish the power supply connection (diagram shows bushing inside device).

PIN NUMBER	SIGNAL NAME
1	110/230 V AC
2	PE
3	0 V DC



5.3.3 Power Supply HOST (IEEE 802.AF)

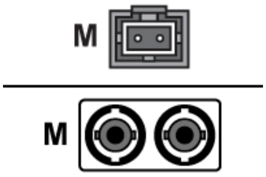
PIN NUMBER	SIGNAL NAME
1	TX +
2	TX -
3	RX +
4	G
5	G
6	RX -
7	-48V
8	-48V



Note:
Transmission of 48V DC power supply is designed for a maximum feeding distance of 100 meters (approx. 330 ft.) in accordance with Ethernet specification requirements. The connected devices may draw 350 mA of power; maximum supply power is 15.4 Watts.

5.3.4 Fibre Optic Ethernet

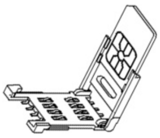
The optical connection requires an MTRJ fibre optic connector.
Multimode cable, MTRJ connector to Duplex connector 62.5/125µm.

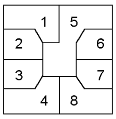


5.3.5 SIM Card Reader, ISO 7816-compatible

The SIM card reader is used for saving configuration data.

PIN NUMBER	SIGNAL NAME
1	VCC 5 Volt
2	RESET
3	CLOCK
4	n/c
5	GND
6	n/c
7	I/O
8	n/c





Note:
Interface and supply connectors are located on the bottom of the device. Secure plugs against slipping out.

6 Initial Device Operations

6.1 First-time Configuration

Warning:

First-time configuration of the device can only be performed via RJ45/optical interface marked HOST.

AN RJ45 PATCH CABLE IS REQUIRED FOR FIRST-TIME CONFIGURATION.

Connection of 24V DC voltage supply

The device may be powered by a **24V DC (two-pole plug)** voltage supply source. The required COMBICON plugs are supplied with the device.

Connect the device to the appropriate voltage supply source.

Connection of RJ45 / optical network cable

For first-time device operations, a connection between the device and a PC via an RJ45/optical network cable is strictly required.

Connect the device to a PC:

Device HOST connector <-> PC LAN adapter

6.2 Manual Network Adapter Configuration via RJ45/optical Cable

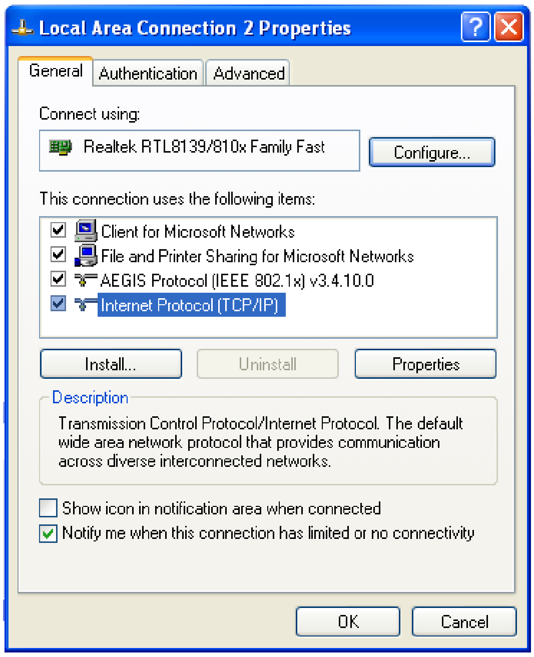
Note:

The following directions and screenshots refers to settings in Windows XP®. The paths and properties described herein may differ for other operating systems.

Open the Properties tab for the network adapter in use. The path is as follows:

Start> Control Panel > Network Connections > Local Area Connection > Properties.

Select **Internet Protocol (TCP/IP)** in the dialogue window that comes up and then click **Properties**.



Connect using:

Realtek RTL8139/810x Family Fast

This connection uses the following items:

☑ Client for Microsoft Networks

☑ File and Printer Sharing for Microsoft Networks

☑ AEGIS Protocol (IEEE 802.1x) v3.4.10.0

☑ Internet Protocol (TCP/IP)

Description

Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

☐ Show icon in notification area when connected

☑ Notify me when this connection has limited or no connectivity

Click to select: **Use the following IP address**

Access to the device is only possible when the following parameters are set as the static IP address or if the computer is located in the same subnet space:

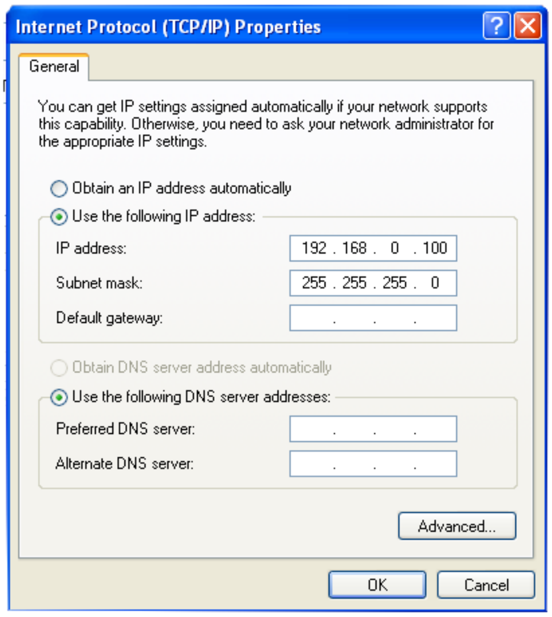
IP ADDRESS: 192.168.0.100

➔ ***Note:***

*The last set of digits must be a number between 1 and 253. In the example, "**100**" was chosen.*

Once the IP address has been entered, the subnet mask address must be set as well. Clicking directly into the field **Subnet mask** will automatically set the correct subnet mask.

SUBNET MASK: 255.255.255.0



Internet Protocol (TCP/IP) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address: 192 . 168 . 0 . 100

Subnet mask: 255 . 255 . 255 . 0

Default gateway: . . .

○ Obtain DNS server address automatically

● Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

You may now close the dialogue windows by clicking "**OK**".

6.3 WLAN Network Adapter Configuration

Follow the directions as given above to configure the WLAN network adapter. However, the IP address parameter needs to be set to a different value. Enter the following IP address in the Internet Protocol properties dialogue:

IP Address: 192.168.0.200

➔

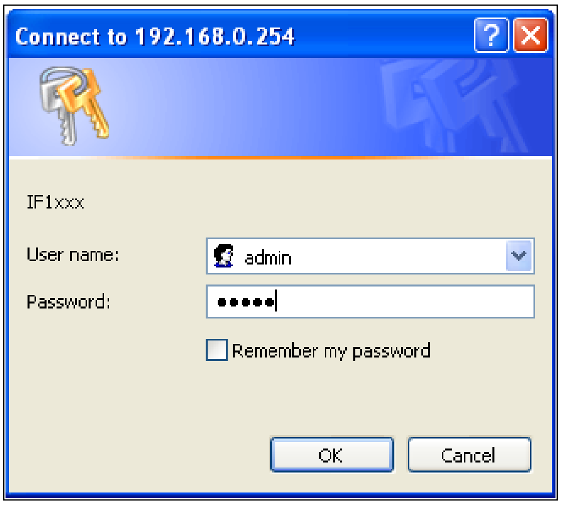
> ***Note:***
>
> *The last set of digits must be a number between 1 and 253. In the example, "**200**" was chosen.*

Calling up the Device Web Interface

To access and open the device web interface, start up your web browser. In the browser's address bar, enter the following IP address then confirm with "**Enter**".

Login

Once the IP address has been entered and confirmed, the login prompt appears. Enter the default values in the login panel.



Connect to 192.168.0.254

IF1xxx

User name: admin

Password: •••••

□ Remember my password

Factory default settings are as follows:

User name : **admin**

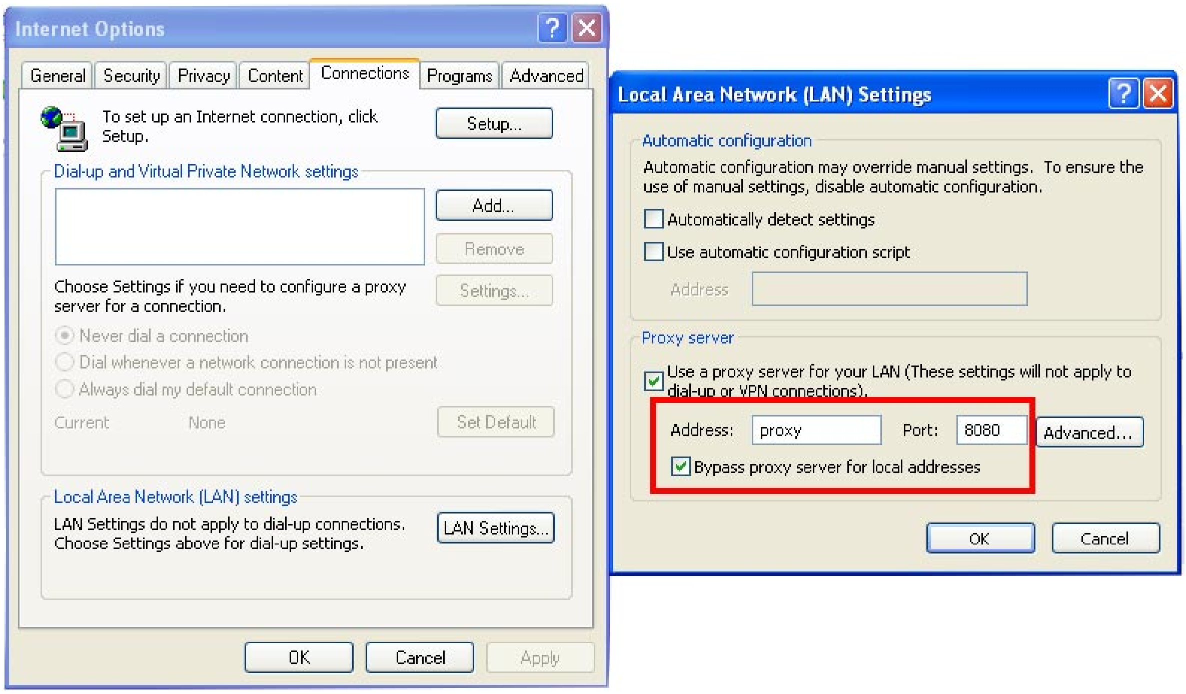
Password : **admin**

Confirm your input by clicking **OK**. The device web interface will subsequently appear.

Note:

If the login prompt does not appear ensure that the device has been connected via a RJ45/optical cable. Otherwise, connect the device to a PC (Device HOST connector <> PC LAN adapter).

If there still is no connection to the firewall login prompt check your proxy and local firewall settings. It is often the case that local subnet addresses (e.g. 192.168.x.x) are diverted to a proxy server. In this case it is possible to select the "Bypass proxy server for local addresses" check box and enter the address spaces in question.



Internet Options

To set up an Internet connection, click Setup.

Dial-up and Virtual Private Network settings

Choose Settings if you need to configure a proxy server for a connection.

○ Never dial a connection
○ Dial whenever a network connection is not present
○ Always dial my default connection

Current None

Local Area Network (LAN) settings

LAN Settings do not apply to dial-up connections. Choose Settings above for dial-up settings.

Local Area Network (LAN) Settings

Automatic configuration

Automatic configuration may override manual settings. To ensure the use of manual settings, disable automatic configuration.

□ Automatically detect settings
□ Use automatic configuration script

Address

Proxy server

☑ Use a proxy server for your LAN (These settings will not apply to dial-up or VPN connections).

Address: proxy Port: 8080

☑ Bypass proxy server for local addresses

6.4 First-time Configuration via Web Interface

Activating WLAN Module(s)

Go to the following web interface page to activate the WLAN module(s):

Basic Settings>Interfaces>WLAN 1/2

Depending on the actual device variant, the unit is equipped with one or two WLAN modules. Activate the desired WLAN module by checking the **Activate Interface** check box in the web interface.

WLAN Module Configuration:

Operating Mode:

The device operating mode needs to be set. Available options are **Access Point** and **Client**.

Network Name (SSID)

The SSID is the visible name of the WLAN. The default setting is **ads**.

You may choose to set the SSID to any alphanumeric value.

WLAN Mode:

Select your preferred WLAN mode:

Warning:

Only use a WLAN mode that is supported by all of your WLAN devices.

Regulatory Authority:

Select your current location.

Warning:

Setting the applicable regulatory authority as well as the respective antenna amplification is solely the responsibility of the operator.

Channel:

Default setting: **Auto**

The device automatically determines the best channel setting.

Saving Configuration Settings:

All changes need to be saved to be activated. To save the modified settings, select the menu item:

Configuration> Save.

Click **Save** in the subsequent dialogue window. The current configuration will now be transmitted and saved.

6.5 Wireless Network Configuration

Once again open up the properties panel located at:

Start> Control Panel > Network Connections

Right-click on your current wireless connection and then select **Properties**. Now click on the tab **Wireless Networks**. In the **Preferred Networks** section on that tab, click the button **Add**. Enter the following parameters:

Network Name SSID: (self-chosen non-default network name), or the default value **ads**

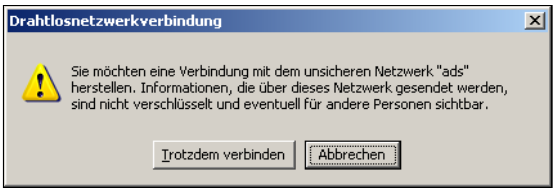
Network Authentication: Open

Data Encryption: Disabled

You may now close the dialogue windows by clicking "**OK**".

6.6 Establishing a Wireless Network Connection

In order to establish a wireless connection to the device, click on the WLAN icon you're your taskbar. A window listing all available networks will appear. Select the wireless network with the appropriate SSID (self-chosen or default name **ads**) and click on **Connect**. The following warning dialogue will pop up:



Drahtlosnetzwerkverbindung

Sie möchten eine Verbindung mit dem unsicheren Netzwerk "ads" herstellen. Informationen, die über dieses Netzwerk gesendet werden, sind nicht verschlüsselt und eventuell für andere Personen sichtbar.

In order to connect to the WLAN you need to select **"Connect Anyway"**. The computer will now establish a wireless connection to the device.

➔

Note:

In case you are unable to establish a connection to the device, we recommend resetting the device to factory default settings.

➔

Note:

The current configuration does not use date encryption to secure wireless communication channels. We recommend using data encryption. Please refer to the chapter Configuration>Security>WLAN 1/2 for details on how to activate and configure encryption.

7 Access Point Setup Wizard

For a simple and fast start-up and configuration of the device, two wizards have been integrated. The setup wizard leads through the configuration of language settings, the operation mode and the password. The filter wizard leads through the configuration of filter rules. Further information is given in the chapter “Packet Filter”. All settings can also be changed independently of the wizards via the web interface.

7.1 First-time Configuration using the Setup Wizard

To perform a basic configuration, select the following under **Quick Links**:

START SETUP WIZARD

➔

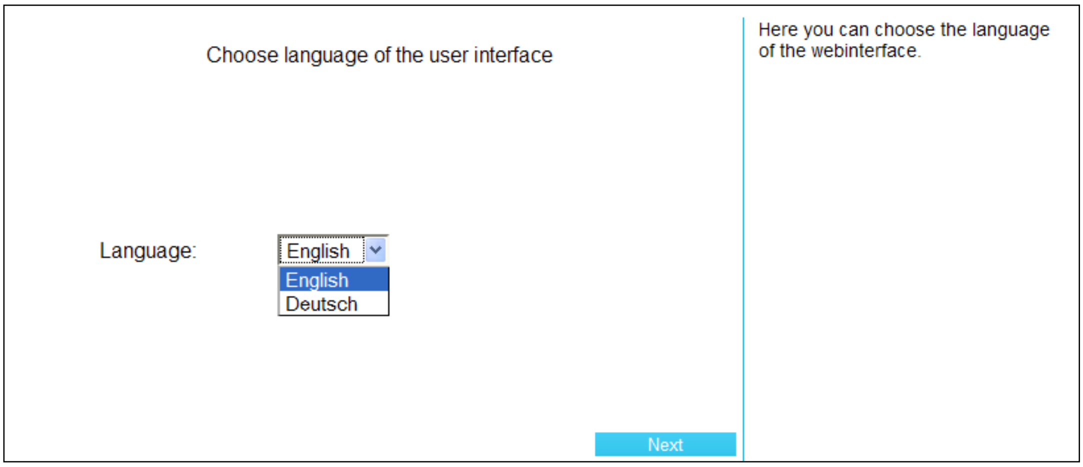
Note:

The question mark ? on the right next to the Drop Down menu contains notes and short explanations on the available menu items.

The notes and short explanations are correctly represented with the Microsoft© Internet Explorer from version 7 and Mozilla Firefox© from version 1.0.

7.1.1 Language Selection

Via the dialogue window it is possible to set the user interface language.



Choose language of the user interface

Language: English

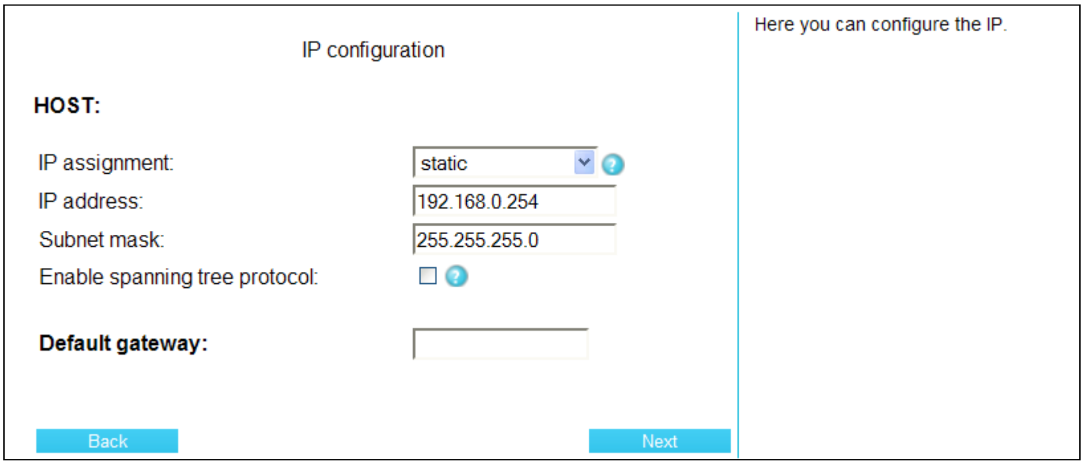
Here you can choose the language of the webinterface.

The selected language is used for the overall web interface.

Confirm your choice by clicking: **Next**

7.1.2 IP Configuration

The IP configuration settings define the behaviour of the HOST interface. The IP address may be assigned statically or automatically.



IP configuration

HOST:

IP assignment: static

IP address: 192.168.0.254

Subnet mask: 255.255.255.0

Enable spanning tree protocol: □

Default gateway:

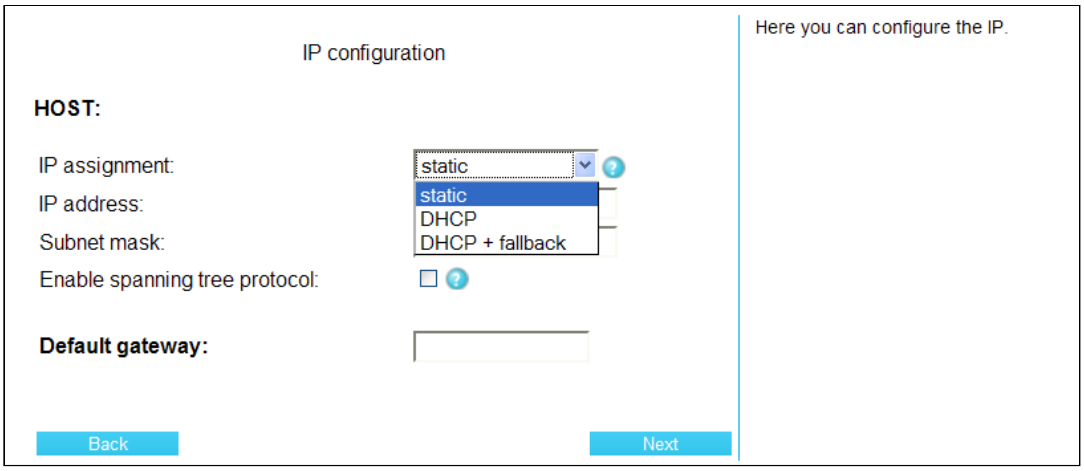
Static:

If this option is selected, it is possible to set a static IP address. Static IP allocation requires entering the IP address and subnet mask.

Default values are:

IP address: **192.168.0.254**

Subnet mask: **255.255.255.0**



IP configuration

HOST:

IP assignment: static

IP address:

Subnet mask:

Enable spanning tree protocol: □

Default gateway:

DHCP:

The DHCP function requests an IP address from a DHCP server and subsequently allocates IP addresses automatically.

DHCP fallback:

This option allows for automatic IP address allocation. Should there be an error with the automatic allocation, the IP allocation automatically switches to the static setting.

Activate Spanning Tree Protocol:

The Spanning Tree Protocol (STP) is used to avoid redundant network loops, especially in switched environments.

If this option is activated, it is possible to establish redundant network connections.

Standard Gateway:

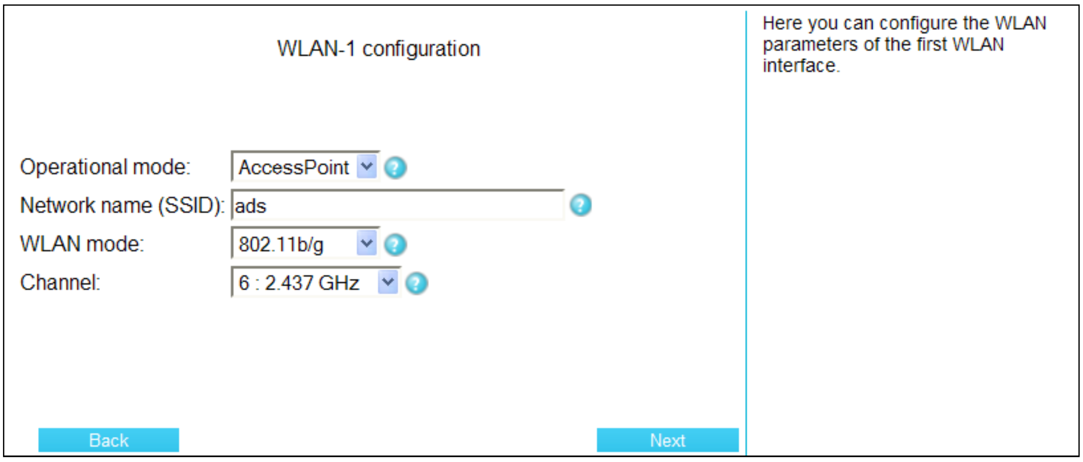
The IP address entered as standard gateway address is used to establish a connection to an address located outside of the device’s own IP subnet (i.e. outside 192.168.0.254 in the example given previously). However, the standard gateway itself needs to be inside the device’s IP subnet address space. In case IP allocation was set to DHCP, the standard gateway address may be dynamically overwritten, providing the DHCP server supports this. The standard gateway may, for instance, be required in order to reach an NTP time server or to relay the IP address to WLAN clients in case the device serves as a DHCP server itself.

Now click **Next**

7.1.3 WLAN-1 Configuration

The next dialogue is used to configure all relevant basic settings for WLAN operation.

Access Point Mode



WLAN-1 configuration

Operational mode: AccessPoint

Network name (SSID): ads

WLAN mode: 802.11b/g

Channel: 6 : 2.437 GHz

Here you can configure the WLAN parameters of the first WLAN interface.

Operating Mode:

Use this option to switch between the two operating modes **Access Point** and **Access Client**.

> ***Note:***
> *The RAC (Access Client) does not offer an operating mode option. It is permanently set to Access Client mode.*

Access Point:

In Access Point mode, the device serves as a network gateway for other wireless devices (clients).

Access Client:

In Access Client mode, the device tries to establish a connection to an Access Point in order to establish a connection with the network.

Network name (SSID):

Use this option to assign a name to your wireless network. We recommend not using any names that allow conclusions with regard to your company, department or the type of data transmitted. Any clients that want to establish a connection with this Access Point need to know this network name.

Default setting is: **ads**

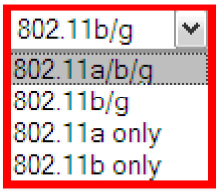
> ***Note:***
> *The SSID may consist of a maximum of 32 characters. Valid characters are: a-z, A-Z, 0-9, valid special characters: . _ - ? $ @ ! { } [ ] ( ) + # ; , < > | : * ~ % $ & / =*

WLAN MODE:

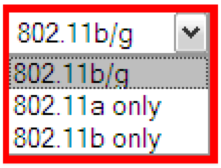
Use this option to select the wireless standard to employ. All clients that are meant to communicate with this Access Point need to be compatible with the selected wireless standard.

The following WLAN modes can be chosen:

ACCESS CLIENT:



ACCESS POINT:



REGULATORY AUTHORITY

Under this option, select the country in which the device is operated. This country setting ensures that applicable national regulations are observed in each country.

WLAN1 (ACCESS POINT & ACCESS CLIENT) 5 GHZ – 802.11A (ETSI):

If the WLAN 802.11a mode or in case of the client, the 802.11a/b/g mode is configured, the following options change:

> ***Hinweis:***
>
> *The Option „Outdoor" is just available in Access Point Mode. The Option „Deactivate DFS" is available in both Modes.*

Indoor/Outdoor:

Must be enabled if the Access Point is part of a radio connection in the outdoor area. Certain channels of the 5GHz band may not be used outdoors, and will be excluded by this option. When used indoors the option indoor can be used. This option is of no importance for Access Clients.

Disable DFS:

You may disable DFS if the Access Point is NOT used outdoors. You may also manually set up channels 36, 40, 44 and 48 as fixed channels, in this case. Additionally, the permissible maximum output power is reduced. In client mode, in contrast to that, DFS may also be disabled for outdoor use.

Note:

In client mode, the DFS function is disabled by default. Caused by the radar detection during data transmission, strong interferences might occur in particular at the client, which have to be evaluated as Potential Radar Pulses. A very high CPU load and faulty, frequently occurring radar detection cycles are results of that. For this reason, DFS should be enabled in client mode only if the client output power exceeds 23dB, and if 30dBm are required for establishing a stable data connection. If another 5GHz device is located near the device in question, this might also cause significant disturbances to the client mode, if DFS is activated there as well.

Warning:

A wrong country setting may lead to illegal radio frequency settings which are punishable by law.

The operator is solely responsible for ensuring the correct country setting.

CHANNEL:

Depending on operator settings, the device can choose a transmission channel automatically or use a manually selected channel. We recommend using automatic channel selection (option **Auto**). In the event of channel interferences, the device can only switch to an interference-free channel if automatic channel selection is activated.

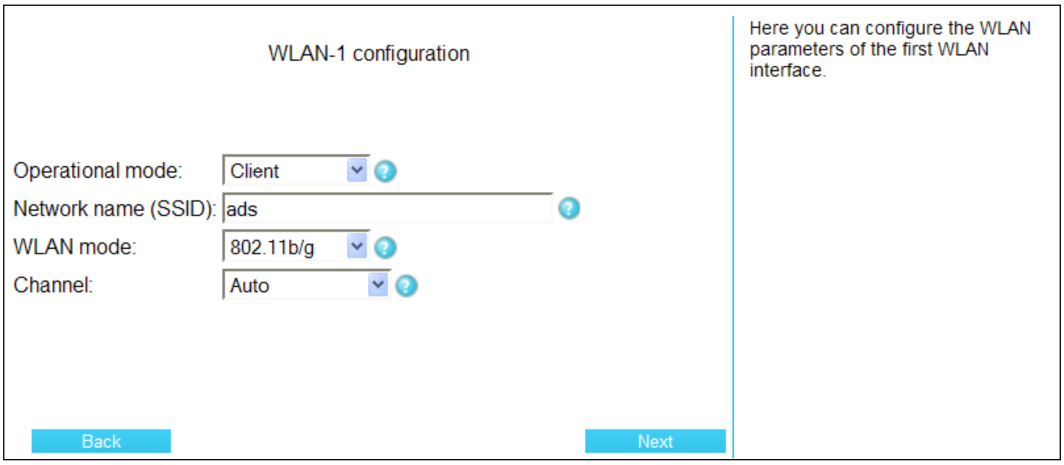
Note:

5GHz channels cannot be selected statically; instead, they are chosen randomly from the available free channels. (This constraint is required for device approval by law.)

In case other WLANs are operated in parallel, manual radio field planning is essential in order to avoid limitations to wireless communications. In this case, the transmission channel should be chosen manually.

Please note that DFS needs to be switched off in order for channels to be selected manually.

Access Client Mode



WLAN-1 configuration

Operational mode: Client

Network name (SSID): ads

WLAN mode: 802.11b/g

Channel: Auto

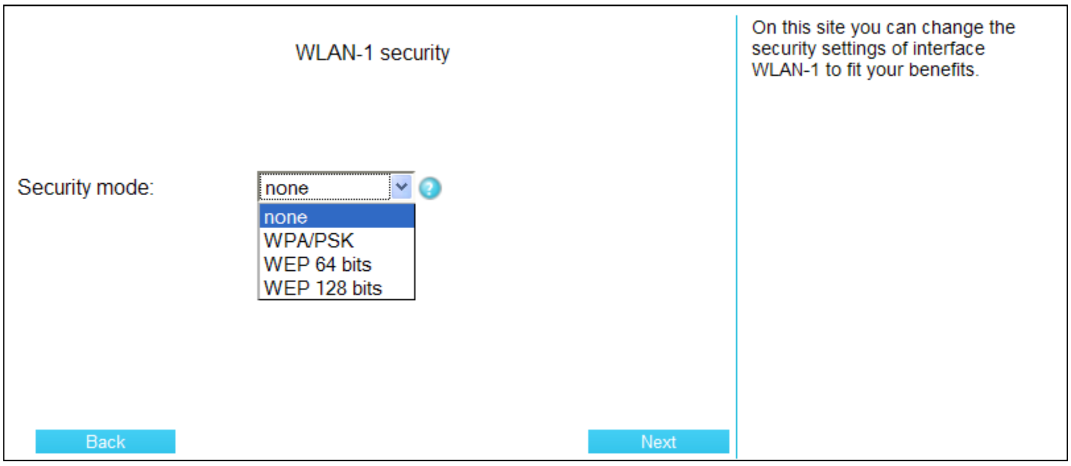
Here you can configure the WLAN parameters of the first WLAN interface.

Client Mode differs with regards to the following additional configuration settings:

Disable DFS:
Activating this option will turn off DFS on the 5GHz band. All channels that can be used without DFS may then be selected manually. This option must not be activated if the unit is operated outdoors.

7.1.4 WLAN-1 Security

Use the WLAN security option to configure the applicable security standards for your WLAN. The following modes can be selected:



WLAN-1 security

Security mode: none

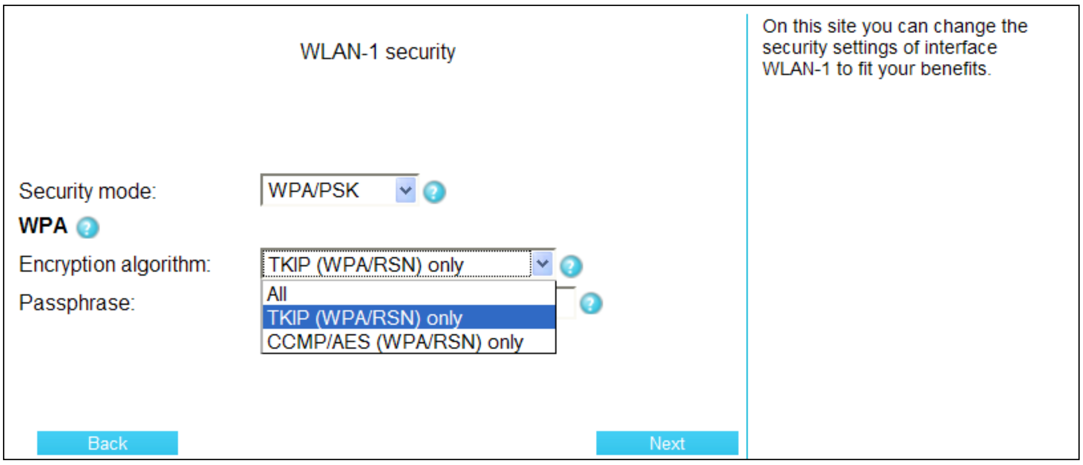
On this site you can change the security settings of interface WLAN-1 to fit your benefits.

WPA/PSK

WPA/PSK mode secures communications by requiring a keyword and employing a particular data encryption method. The keyword (Pre-Shared Key) may contain a minimum of 8 and a maximum of 63 characters. Rather than actual words, we recommend using alphanumeric combinations of letters and numbers in order to ensure optimal security.

➔ ***Note:***

Pre-Shared Key specifications: 8-63 characters; valid are all characters between ASCII code 32 and 116


WLAN-1 security

Security mode: WPA/PSK

WPA

Encryption algorithm: TKIP (WPA/RSN) only

Passphrase:

On this site you can change the security settings of interface WLAN-1 to fit your benefits.

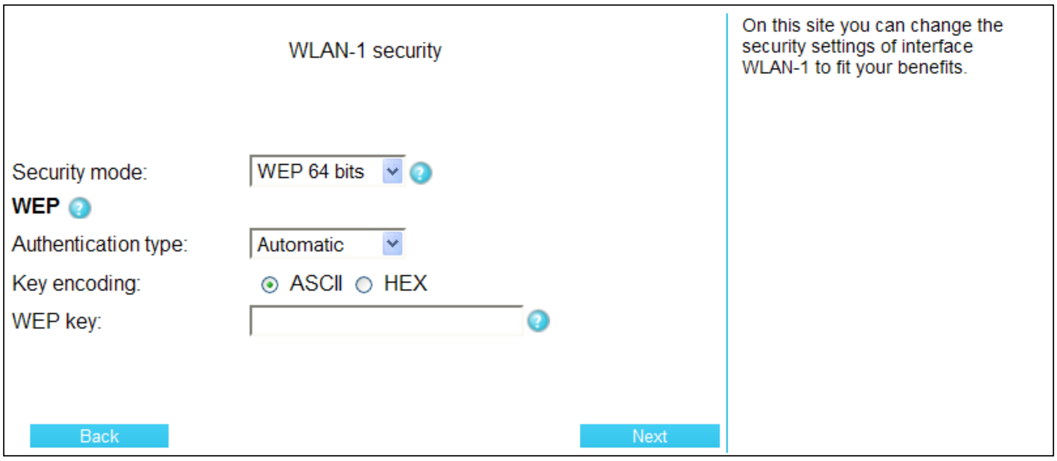
Data Encryption:

You may choose to either use all data encryption methods or select a particular method. Please note that WPA 2 encryption requires that all network access points and clients support the WPA 2 standard.

WEP 64 Bits / WEP 128 Bits

Like WPA, the WEP 64 Bits / 128 Bits mode requires a keyword for securing wireless communications. The chief difference is that in WPA mode, this key changes dynamically during a connection, whereas it remains static in WEP mode.

> ***Note:***
> *We recommend using the WPA encryption standard because WEP-based data encryption has to be regarded as insufficient by today's standards.*



WLAN-1 security

Security mode: WEP 64 bits

WEP

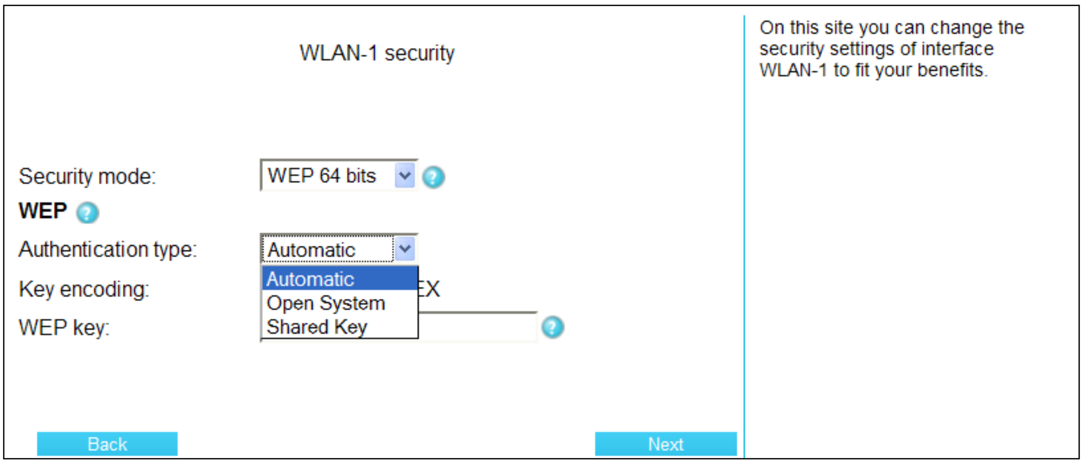
Authentication type: Automatic

Key encoding: ◉ ASCII ○ HEX

WEP key:

On this site you can change the security settings of interface WLAN-1 to fit your benefits.

Authentication Mode:



WLAN-1 security

Security mode: WEP 64 bits

WEP

Authentication type: Automatic

Key encoding:

WEP key:

On this site you can change the security settings of interface WLAN-1 to fit your benefits.

Automatic:

In **Automatic** mode, the authentication mode is selected automatically.

Open System:

Open System authentication is the default authentication setting.

Shared Key:

Shared Key authentication employs an enhanced handshake mechanism during login, which does, however, not provide any additional security.

Key Encoding:

You may select ASCII or HEX key encoding. ASCII is a 7-bit encoding scheme, HEX is a 16-bit scheme.

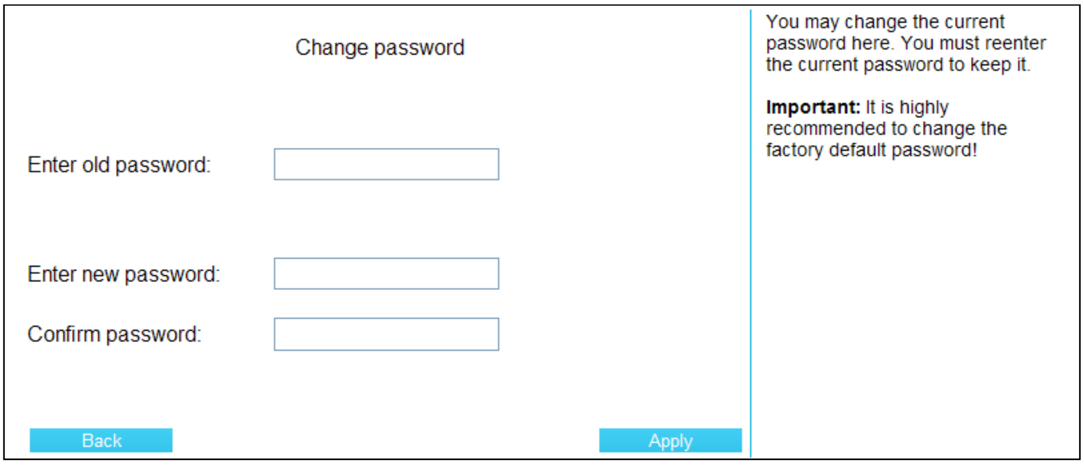
WEP Key:

WEP key length is limited to 5 characters in ASCII encoding mode. Using HEX encoding, keys with a length of up to 10 characters may be chosen. Rather than actual words, we recommend using alphanumeric combinations of letters and numbers in order to ensure optimal security.

Confirm by clicking **Next**

7.1.5 Changing the Password

Use this dialogue to change the device password.



Change password

Enter old password:

Enter new password:

Confirm password:

You may change the current password here. You must reenter the current password to keep it.

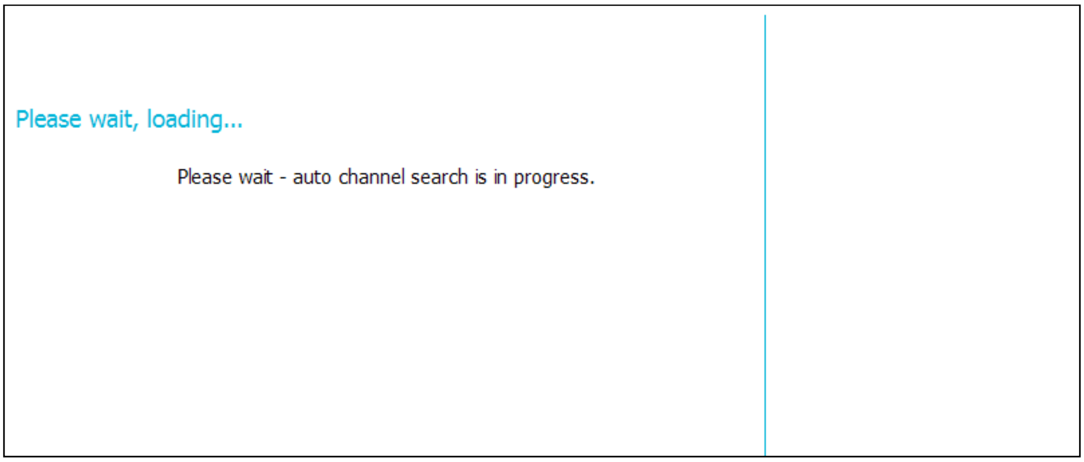
Important: It is highly recommended to change the factory default password!

In order to change the password, enter the current password in the field **Old Password**.

Choose a new password and confirm it by entering it in the next two fields (**New Password** and **Password Confirmation**). Leave all fields empty in case you have not set a password.

Subsequently click on the **Apply** button.

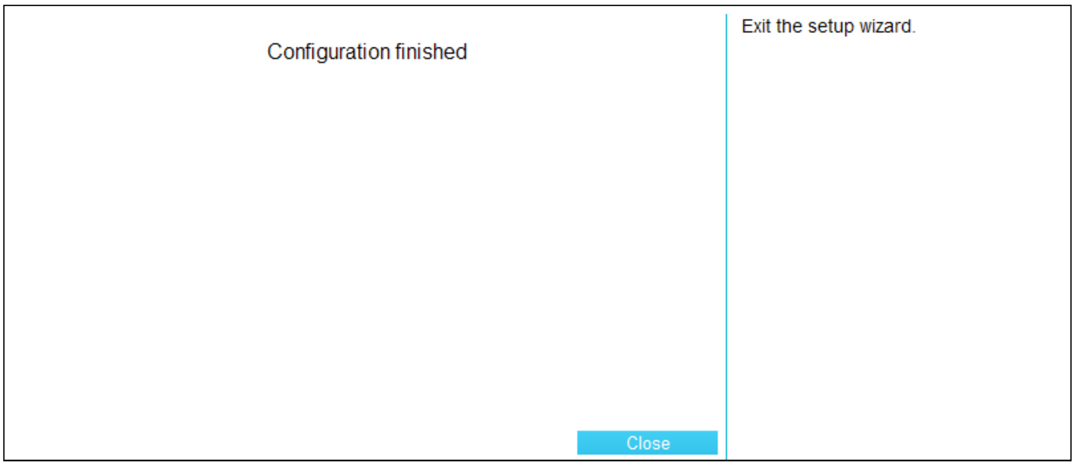
Your settings are being saved…



Please wait, loading...

Please wait - auto channel search is in progress.

The Setup Wizard is now complete.



Configuration finished

Exit the setup wizard.

7.2 Configuration using the Filter Wizard

The function of the packet filter of a device is to classify data packets in desired and undesired data traffic and to initiate appropriate actions.

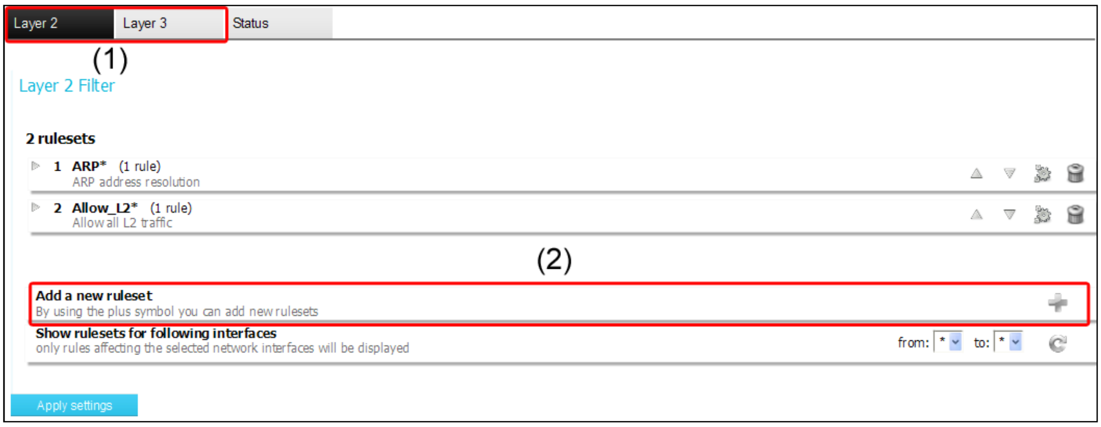
The packet filter can be started through the path **Configuration > Packet Filter** unless it is started directly after the **Setup Wizard.**

The homepage of the packet filter allows to add new rule sets and to process existing rule sets.

> ***Note:***
> *A rule describes the configuration of a specific filter instruction. A rule set can consist of up to ten separate rules.*

7.2.1 Adding a Rule Set

Adding a rule set first requires the selection of the layer over the respective **Tab** (**1**). In the Transparent Bridge Mode, filtration on bridged Ethernet interfaces (**Layer 2**) is necessary in most cases while in the IP Router Mode or when using the SERVICE modem it is also possible to choose independent IP interfaces (**Layer 3**).



Layer 2 Filter

2 rulesets

1 **ARP*** (1 rule)
ARP address resolution

2 **Allow_L2*** (1 rule)
Allow all L2 traffic

Add a new ruleset
By using the plus symbol you can add new rulesets

Show rulesets for following interfaces
only rules affecting the selected network interfaces will be displayed
from: * to: *

<u>Bridged Ethernet interfaces (Layer 2):</u>

Corresponding to the Ethernet filtration level. This setting makes possible, e.g. filtration by means of Ethernet MAC addresses or network protocols not using IP addresses. Filtration on the basis of IP protocol features however is also possible.

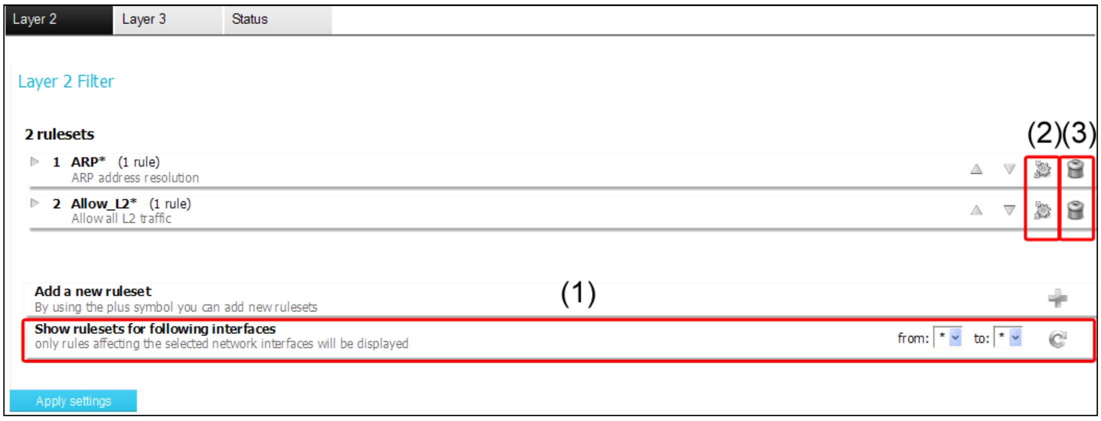
<u>Independent IP interfaces (Layer 3):</u>

On this level, filtration is only possible on the basis of IP protocol features because between the interfaces of level 3 only IP data traffic takes place.

Click on the button **Add a new rule set** (**2**) to create or add a new or pre-configured rule for the selected layer. A description of how to create a new rule set is given in the chapters **Define a new rule set on Layer 2** and **Define a new rule set on Layer 3.** The chapter **Load a pre-configured rule set** describes the predefined rule set.

7.2.2 Changing and Searching existing Rule Sets

If you have already created or loaded rules, they appear in the Rules Matrix. If you search for a rule, you may restrict the filter criteria for the searched rule set by clicking on the Drop Down boxes **From**, **To** (**1**).



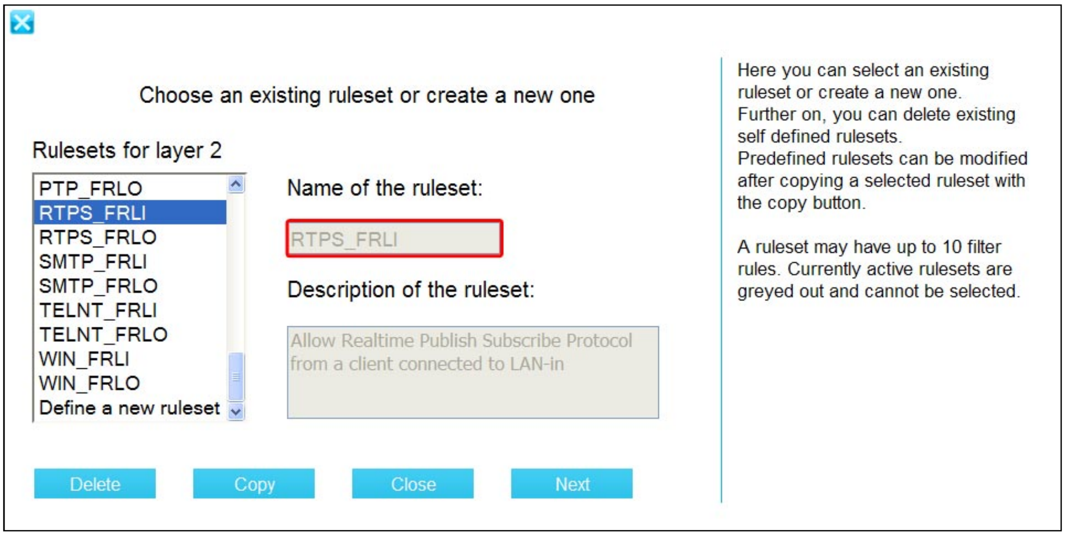
The button **Process** (**2**) is used to subsequently change the selected rule set. The selected rule set is removed by clicking on **Delete** (**3**).

Note:

By clicking on the arrows in front of each rule set, detailed information on the selected rule set is displayed.

7.2.3 Loading pre-configured Rule sets

Select a pre-configured rule set.
The pre-configured rule sets are displayed on the left of the dialogue window.



Choose an existing ruleset or create a new one

Rulesets for layer 2

- PTP_FRLO
- RTPS_FRLI
- RTPS_FRLO
- SMTP_FRLI
- SMTP_FRLO
- TELNT_FRLI
- TELNT_FRLO
- WIN_FRLI
- WIN_FRLO
- Define a new ruleset

Name of the ruleset: RTPS_FRLI

Description of the ruleset: Allow Realtime Publish Subscribe Protocol from a client connected to LAN-in

Here you can select an existing ruleset or create a new one. Further on, you can delete existing self defined rulesets. Predefined rulesets can be modified after copying a selected ruleset with the copy button.

A ruleset may have up to 10 filter rules. Currently active rulesets are greyed out and cannot be selected.

By way of example, the following standard rule sets are pre-configured for layers 2 and 3.

Layer 2 Rule Sets

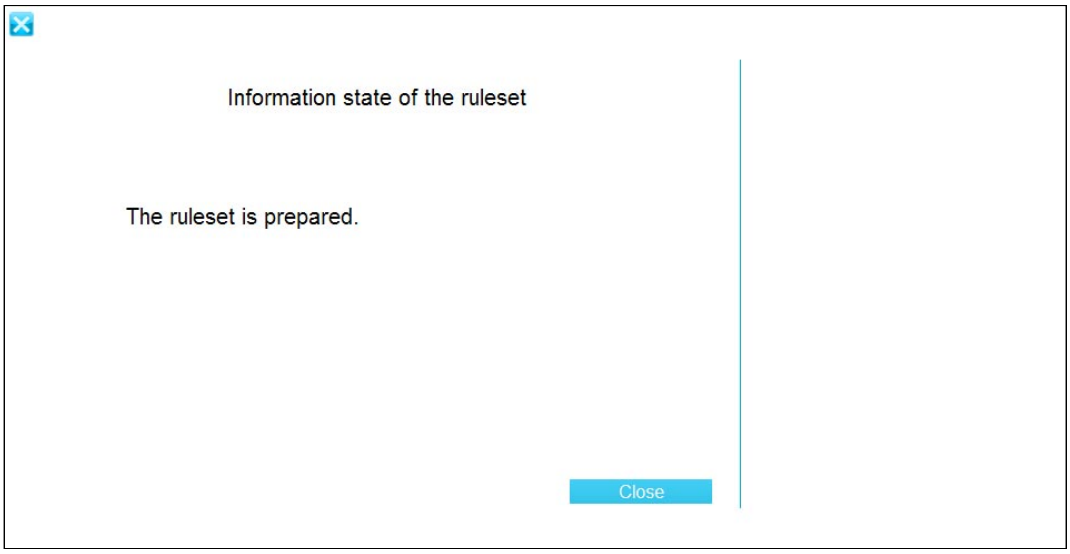
Name	Brief Description
ARP	Address Resolution Protocol allows assignment of network addresses to hardware addresses
Allow_L2	Allows all data traffic on layer 2
Block_L2	Discards all data packets (i.e. blocks all data traffic) on layer 2
ICMP_L2	Allows all ICMP-based data traffic on layer 2
Log_L2	Maintains an event log and discards all data packets on layer 2

Select the rule set you want to load and confirm by clicking **Next**,

Rule sets for Layer 3

Name	Brief Description
ALLOW_L3	Allows all data traffic on layer 3
BLOCK_L3	Discards all data packets (i.e. blocks all data traffic) on layer 3
ICMP_L3	Allows all ICMP-based data traffic on layer 3
Log_L3	Maintains an event log and discards all data packets on layer 3

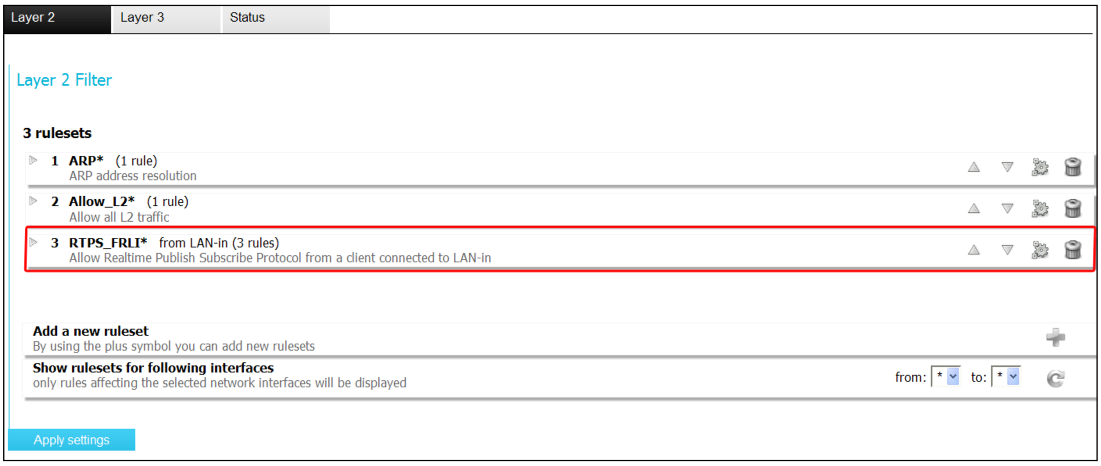
Confirm the next message prompt by clicking **Close**.



Information state of the ruleset

The ruleset is prepared.

Once a rule set has been successfully loaded and activated, it will be shown in the filter overview page.



Layer 2 Filter

3 rulesets

1 **ARP*** (1 rule)
ARP address resolution

2 **Allow_L2*** (1 rule)
Allow all L2 traffic

3 **RTPS_FRLI*** from LAN-in (3 rules)
Allow Realtime Publish Subscribe Protocol from a client connected to LAN-in

Add a new ruleset
By using the plus symbol you can add new rulesets

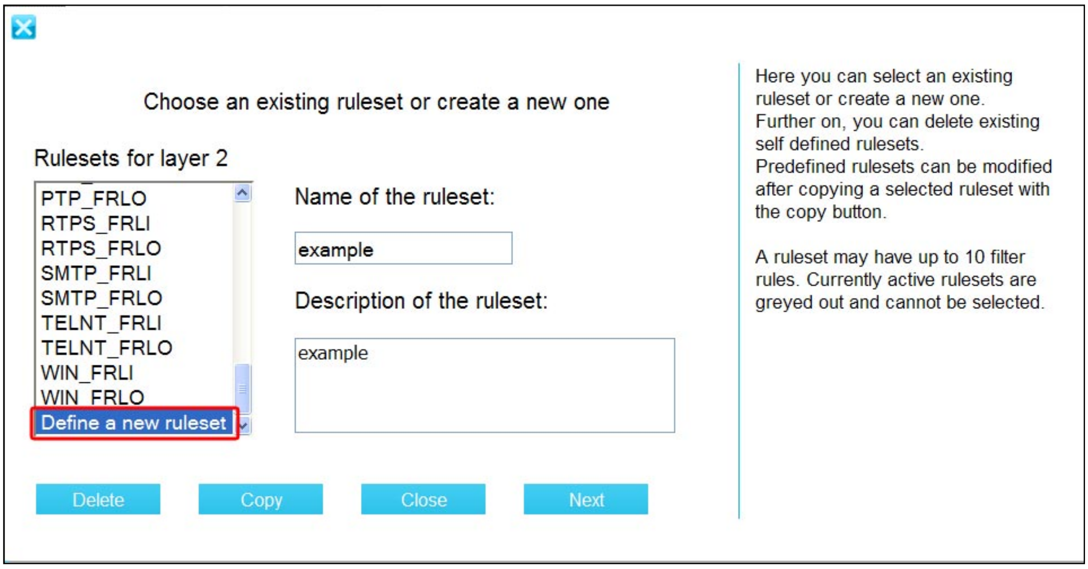
Show rulesets for following interfaces
only rules affecting the selected network interfaces will be displayed

from: * to: *

7.2.4 Definition of a new Rule set on Layer 2

Note:
*For configuring rules on layer 3, please refer to the section **"Definition of a new Rule set on Layer 3".***

Select the menu item **Definition of a new rule set**



Choose an existing ruleset or create a new one

Rulesets for layer 2

PTP_FRLO
RTPS_FRLI
RTPS_FRLO
SMTP_FRLI
SMTP_FRLO
TELNT_FRLI
TELNT_FRLO
WIN_FRLI
WIN_FRLO
Define a new ruleset

Name of the ruleset: example

Description of the ruleset: example

Here you can select an existing ruleset or create a new one. Further on, you can delete existing self defined rulesets. Predefined rulesets can be modified after copying a selected ruleset with the copy button.

A ruleset may have up to 10 filter rules. Currently active rulesets are greyed out and cannot be selected.

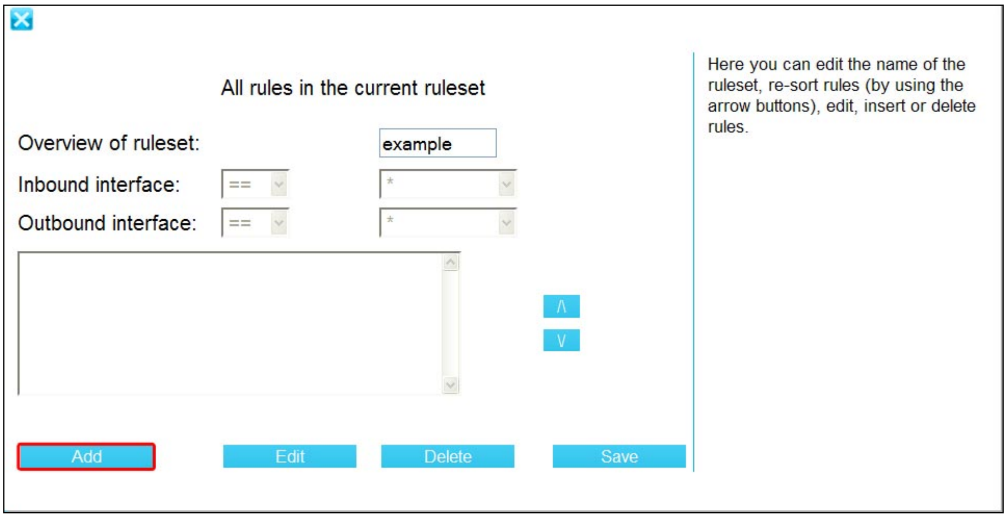
Enter a name and a description for the new rule set.

Note:
The rule set name is restricted to 10 characters. It is not possible to use umlauts.

Confirm your input by clicking **Next.**

Rule set Layers and Interfaces

The following dialogue allows configuration of the type of filtering.



All rules in the current ruleset

Overview of ruleset: example

Inbound interface: == *

Outbound interface: == *

Here you can edit the name of the ruleset, re-sort rules (by using the arrow buttons), edit, insert or delete rules.

Symbol Description	
==	Filter will be applied to the selected interface.
!=	Filter will be applied to all interfaces **except for** the selected interface.

Example:

Interface	Selection	Result
Incoming interface: **HOST**	==	filters all inbound data packets on **HOST**
Outgoing interface: **WLAN-1**	!=	filters all outgoing data packets on all ports, **except for WLAN-1**

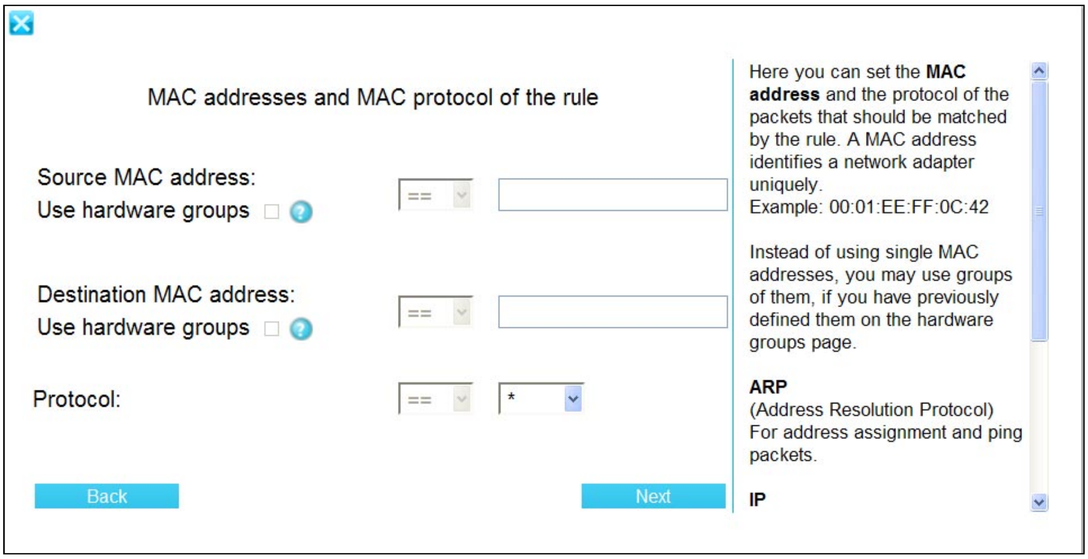
Confirm your input by clicking **Next**

RULE-RELATED MAC ADDRESSES AND MAC PROTOCOLS

Via the following dialogue window it is possible to define the MAC addresses of the respective sources and targets.

The **Source MAC Address** defines the source from which data is received.

The **Target MAC Address** defines the target to which data is sent.



MAC addresses and MAC protocol of the rule

Source MAC address: ==

Use hardware groups □

Destination MAC address: ==

Use hardware groups □

Protocol: == *

Here you can set the **MAC address** and the protocol of the packets that should be matched by the rule. A MAC address identifies a network adapter uniquely.
Example: 00:01:EE:FF:0C:42

Instead of using single MAC addresses, you may use groups of them, if you have previously defined them on the hardware groups page.

ARP
(Address Resolution Protocol)
For address assignment and ping packets.

IP

In case you are using a permanent, static connection between two devices, you may enter their respective MAC addresses here. Otherwise leave the asterisk symbol unchanged.

➔ ***Note:***
If the option "Used Hardware Groups" is activated, a selection among the added hardware groups is possible. Use this option if you want to allocate rules for more than one MAC address.

➔ ***Note:***
If you want to use a permanent connection between two defined devices, you may define the MAC addresses of the respective devices here.

PROTOCOL	DESCRIPTION
ARP	The Address Resolution Protocol (ARP) is a network protocol that allows resolving network addresses to hardware addresses. ARP is not an IP-only or Ethernet-only protocol, but due to the prevalence of IPv4 and Ethernet, it is used almost exclusively for resolving IP addresses to Ethernet MAC addresses.
IPv4	IPv4 (Internet Protocol Version 4, formerly simply IP), is the fourth iteration of the Internet Protocol (IP). It is the first version of the protocol to be widely deployed and is one of the essential underlying internet technologies.
Vlan	A Virtual Local Area Network (VLAN) is a virtual local network inside a physical network. The protocol commonly used in configuring virtual LANs is IEEE 802.1Q.
Other	Allows selection of a different protocol.

➔ **_Note:_**

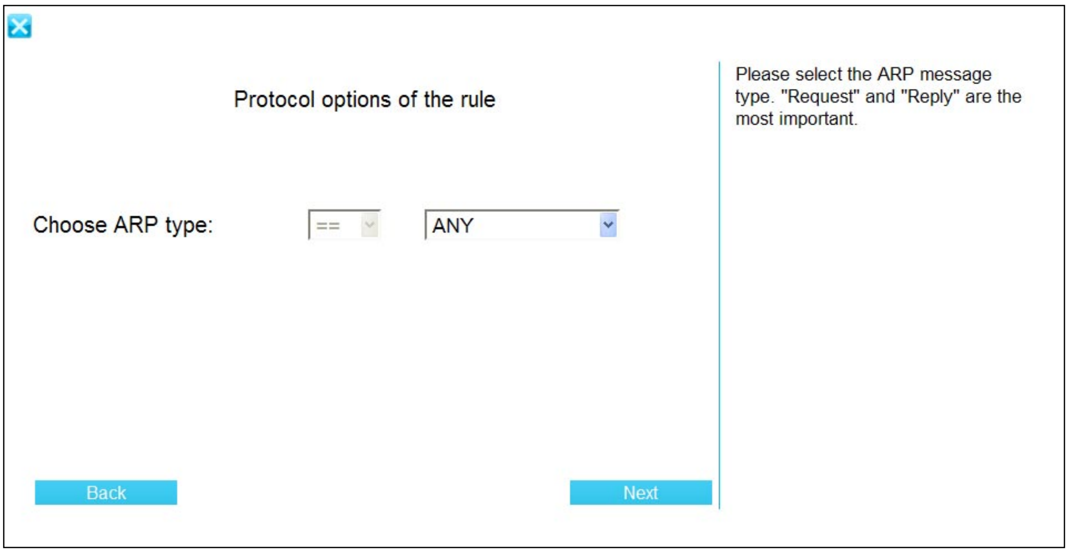
If you do not wish to select a particular protocol, choose the default menu item (i.e. the asterisk item). Once a specific protocol has been selected you may adjust protocol-specific configuration settings.

PROTOKOLLOPTIONEN

Folgende Konfigurationsmöglichkeiten bestehen, wenn Sie eines der Protokolle ARP, IPV4, VLAN oder Other gewählt haben:

The following configuration options are available once a specific protocol has been selected. In case you have not selected a particular protocol, simply confirm this screen by clicking **Next** and follow the steps described in the **Rule Name and Behaviour** section.

ARP:

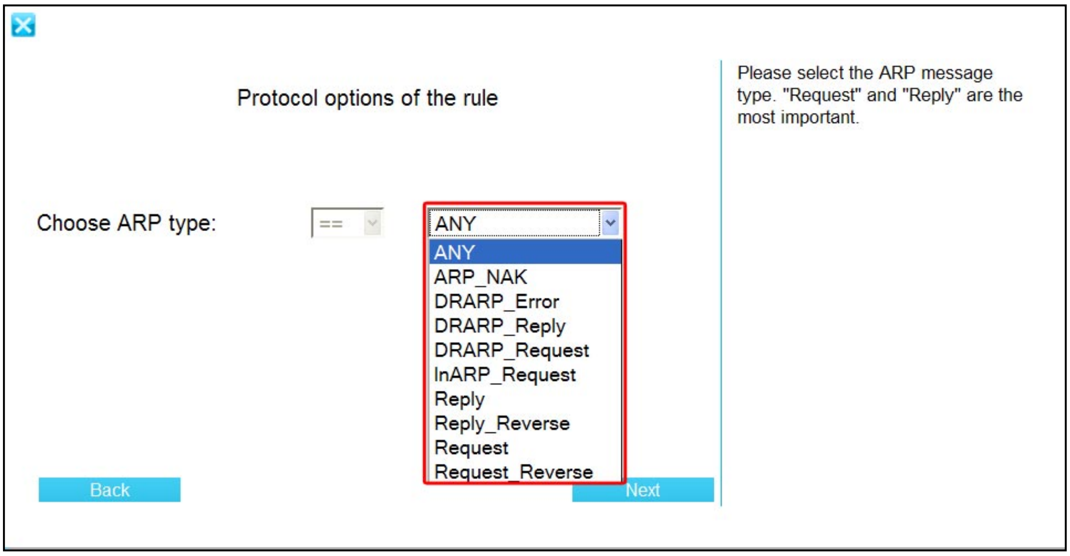


Protocol options of the rule

Choose ARP type: == ANY

Please select the ARP message type. "Request" and "Reply" are the most important.

ARP offers the following options:



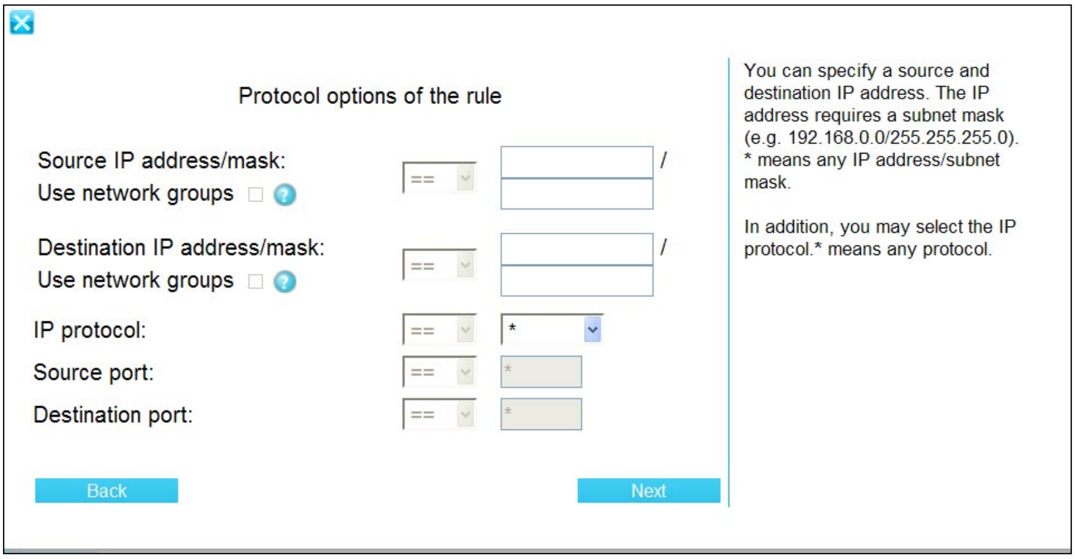
Protocol options of the rule

Choose ARP type: == ANY

Please select the ARP message type. "Request" and "Reply" are the most important.

IPv4:

IPv4 requires setting a source and a target IP address. Furthermore, the respective subnet mask for the source and target IP address is required.



You can specify a source and destination IP address. The IP address requires a subnet mask (e.g. 192.168.0.0/255.255.255.0). * means any IP address/subnet mask.

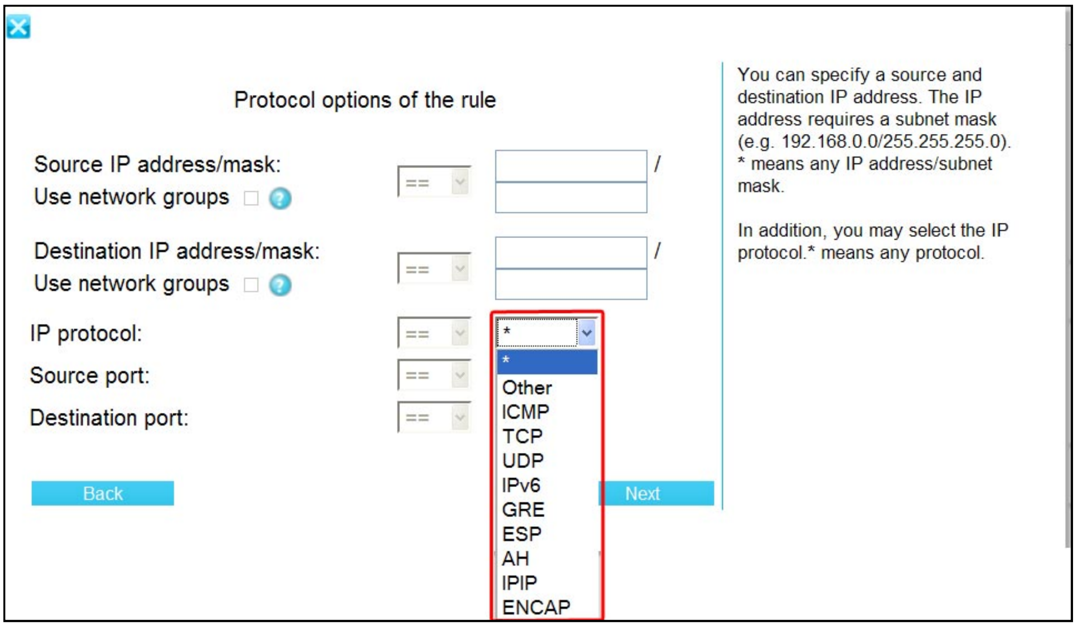
In addition, you may select the IP protocol.* means any protocol.

The IPV4 protocol allows another comprehensive selection of filter criteria. It is possible to filter Source IP address, Target IP address, IP protocol, Source and Target Port.

Note:

TCP/UDP ports can be indicated as port ranges, e.g. 80:88 for 80-88, :1024 (all ports<1024), or 1024: (all ports larger than 1024)

The Internet Protocol offers the following options:

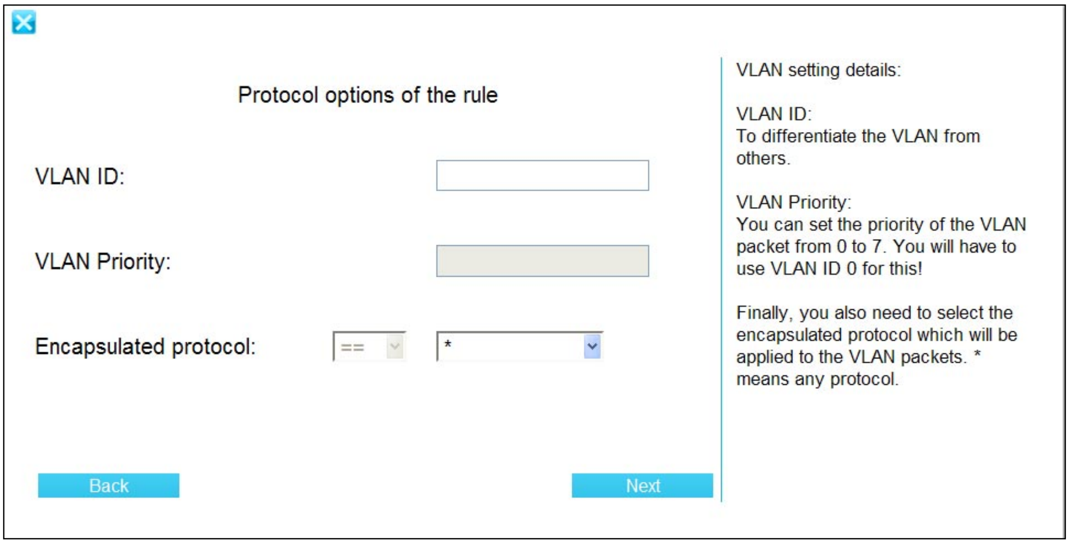


You can specify a source and destination IP address. The IP address requires a subnet mask (e.g. 192.168.0.0/255.255.255.0). * means any IP address/subnet mask.

In addition, you may select the IP protocol.* means any protocol.

VLAN:

The VLAN protocol requires setting a VLAN ID, a VLAN priority and a Wrapped Protocol to be used.



Protocol options of the rule

VLAN ID:

VLAN Priority:

Encapsulated protocol: == *

VLAN setting details:

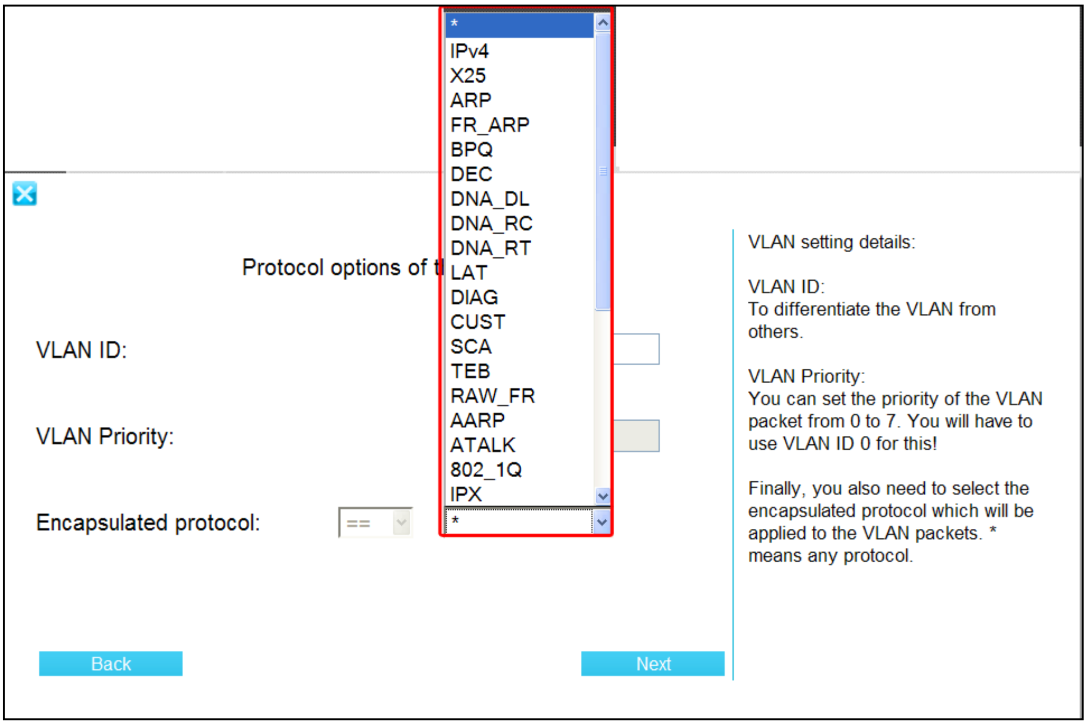
VLAN ID:
To differentiate the VLAN from others.

VLAN Priority:
You can set the priority of the VLAN packet from 0 to 7. You will have to use VLAN ID 0 for this!

Finally, you also need to select the encapsulated protocol which will be applied to the VLAN packets. * means any protocol.

For the VLAN protocol it is necessary to state the VLAN ID, the VLAN priority and the packed protocol.

The packed protocol contains a large number of different protocol versions for selection. You may choose whether you want to use a specific protocol or any but the specific protocol.



Protocol options of t

VLAN ID:

VLAN Priority:

Encapsulated protocol: == *

VLAN setting details:

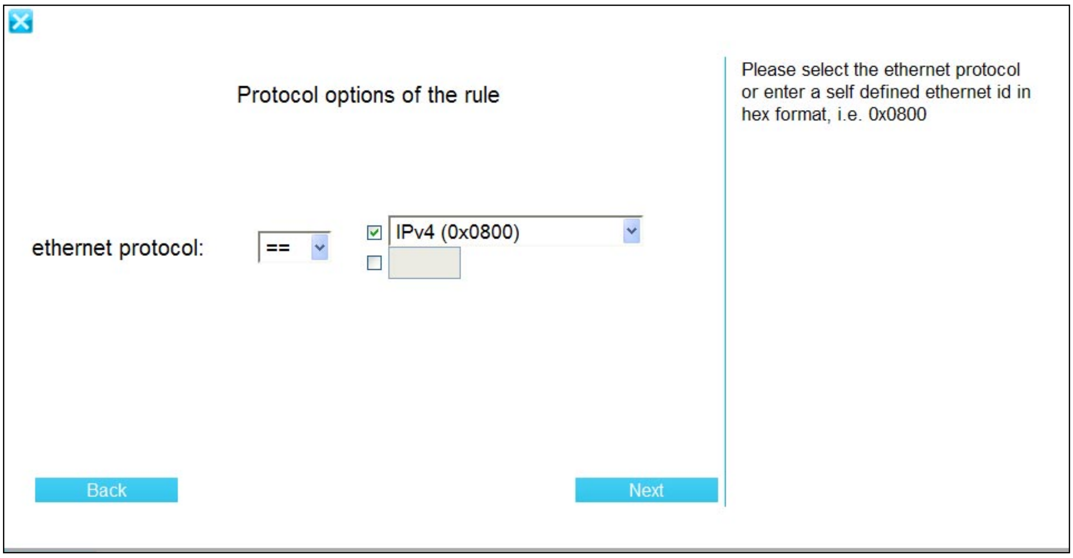
VLAN ID:
To differentiate the VLAN from others.

VLAN Priority:
You can set the priority of the VLAN packet from 0 to 7. You will have to use VLAN ID 0 for this!

Finally, you also need to select the encapsulated protocol which will be applied to the VLAN packets. * means any protocol.

OTHER:

Use **Other** to select the Layer 3 protocol.

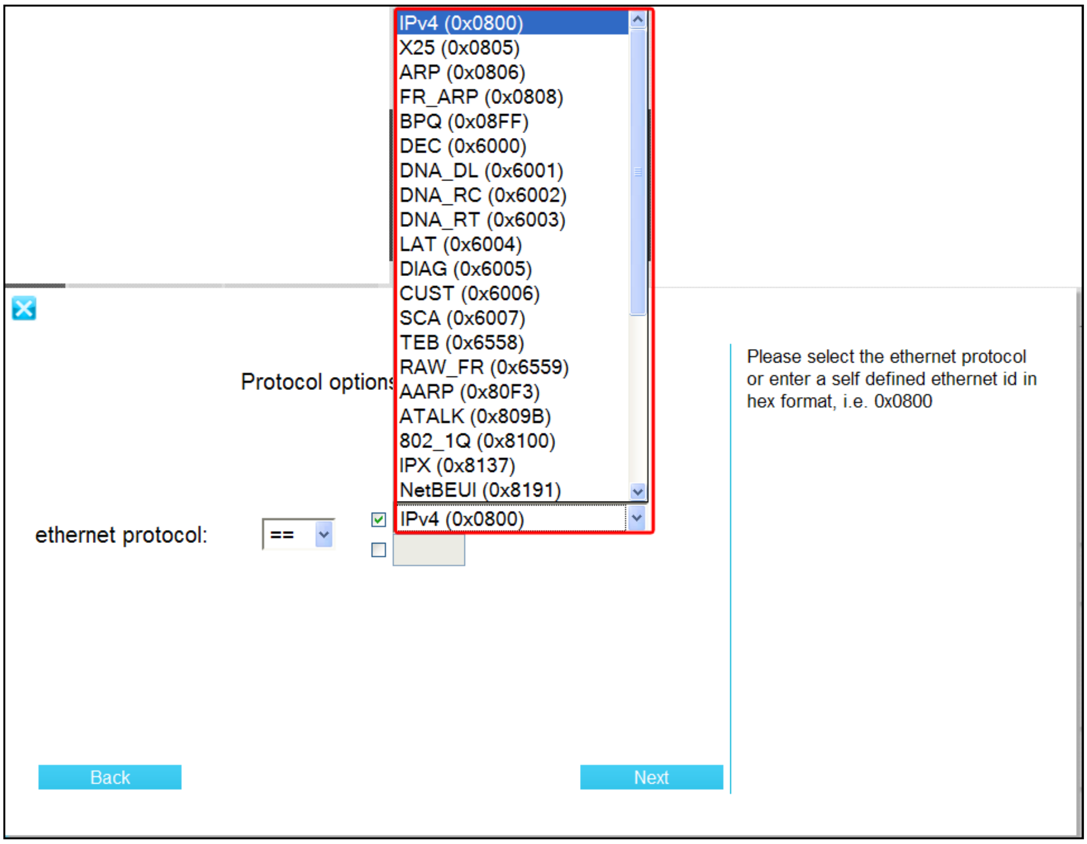


Protocol options of the rule

ethernet protocol: == ☑ IPv4 (0x0800) □

Please select the ethernet protocol or enter a self defined ethernet id in hex format, i.e. 0x0800

Other contains a large number of different protocols for selection. You may choose whether you want to use a specific protocol or any but the specific protocol.



IPv4 (0x0800)
X25 (0x0805)
ARP (0x0806)
FR_ARP (0x0808)
BPQ (0x08FF)
DEC (0x6000)
DNA_DL (0x6001)
DNA_RC (0x6002)
DNA_RT (0x6003)
LAT (0x6004)
DIAG (0x6005)
CUST (0x6006)
SCA (0x6007)
TEB (0x6558)
RAW_FR (0x6559)
AARP (0x80F3)
ATALK (0x809B)
802_1Q (0x8100)
IPX (0x8137)
NetBEUI (0x8191)

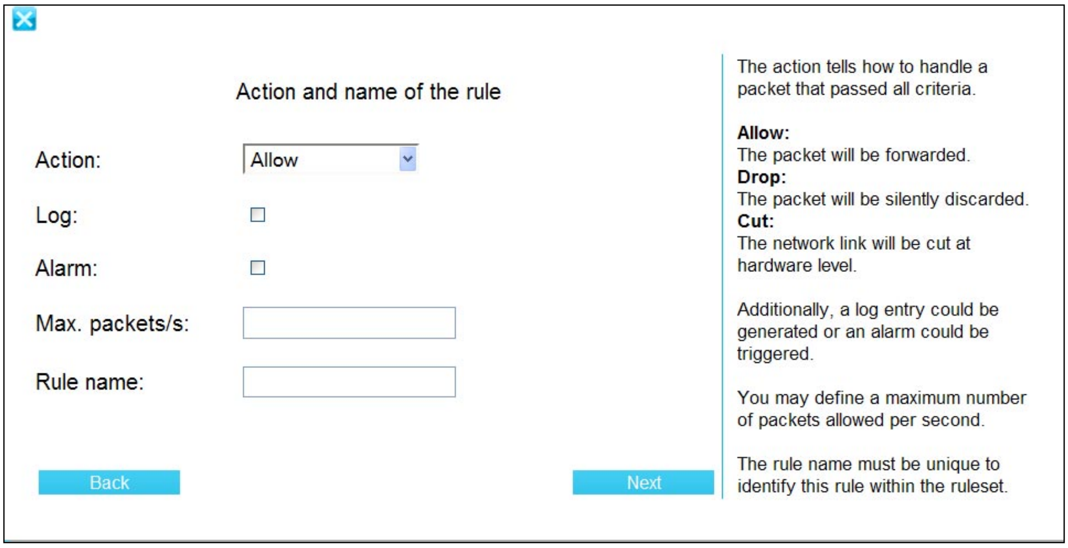
Protocol options

ethernet protocol: == ☑ IPv4 (0x0800) □

Please select the ethernet protocol or enter a self defined ethernet id in hex format, i.e. 0x0800

RULE NAME AND BEHAVIOUR:

The next dialogue will allow you to define the rule behaviour in more detail. Use the menu item **Rule Action** to determine how the device should handle packets.



Action and name of the rule

Action: Allow

Log: □

Alarm: □

Max. packets/s:

Rule name:

The action tells how to handle a packet that passed all criteria.

Allow:
The packet will be forwarded.
Drop:
The packet will be silently discarded.
Cut:
The network link will be cut at hardware level.

Additionally, a log entry could be generated or an alarm could be triggered.

You may define a maximum number of packets allowed per second.

The rule name must be unique to identify this rule within the ruleset.

Rule Action:
Available options are Allow and Block.

Log:
This function will log any violations of this rule in the event log.

Max. Packets/sec:

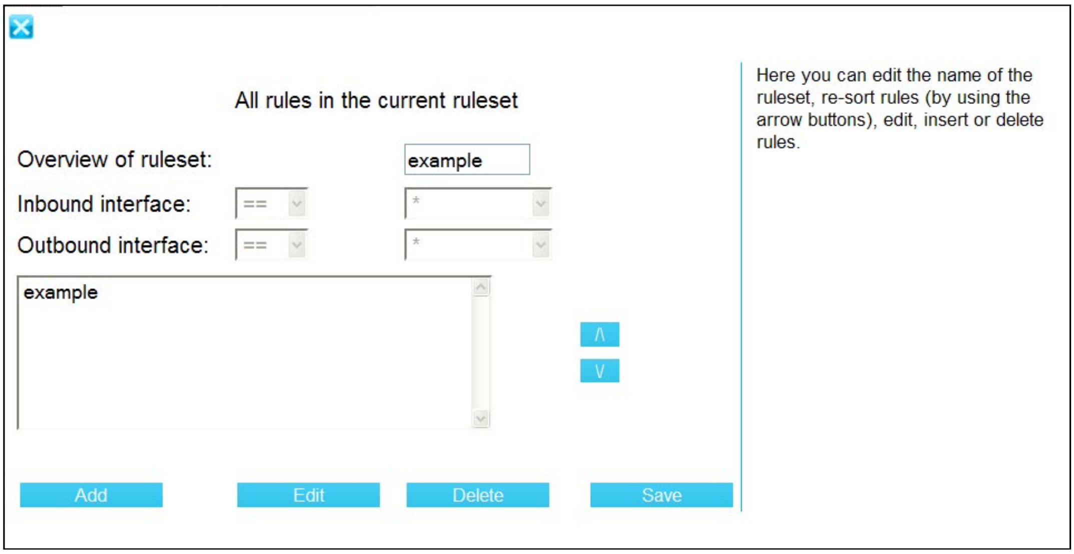
Use this option to specify a maximum packet rate per second; this rate will then serve as a upper limit against Denial-of-Service attacks.

Rule Name:
Choose a name for this rule; the name should be unique, i.e. differ from the name of any other rule set.

Confirm by clicking **Next**.

OVERVIEW OF ALL RULES IN A RULE SET:

The next dialogue window will provide an overview of all existing rule sets.



All rules in the current ruleset

Overview of ruleset: example

Inbound interface: == *

Outbound interface: == *

example

Here you can edit the name of the ruleset, re-sort rules (by using the arrow buttons), edit, insert or delete rules.

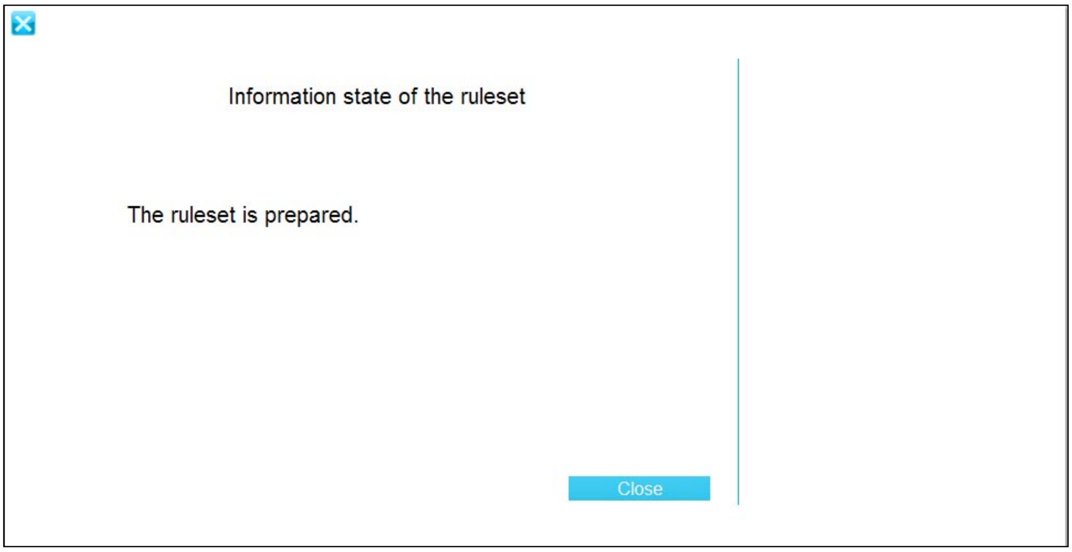
Use the **Add** button for starting the rule configuration process anew to define another rule. The **Edit** button allows subsequent modifications to previously defined rules.

Choose **Delete** to delete the selected rule.

Use the arrow buttons to modify the position of a rule within the current rule set.

Confirm by clicking **Save**.

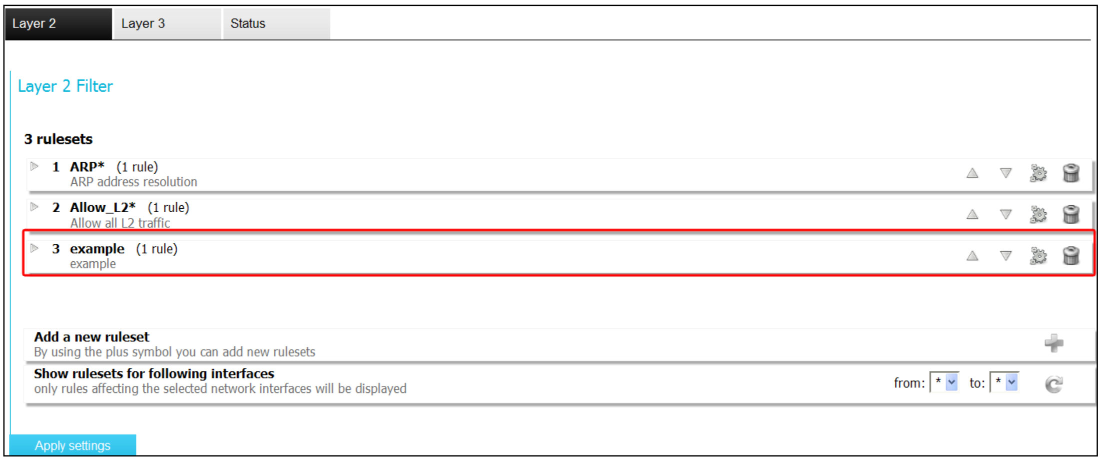
Confirm the next message prompt by clicking **Close**.



Information state of the ruleset

The ruleset is prepared.

Once the rule set was successfully activated, it will be displayed in the filter overview window.



Layer 2 Filter

3 rulesets

1 **ARP*** (1 rule)
ARP address resolution

2 **Allow_L2*** (1 rule)
Allow all L2 traffic

3 **example** (1 rule)
example

Add a new ruleset
By using the plus symbol you can add new rulesets

Show rulesets for following interfaces
only rules affecting the selected network interfaces will be displayed

from: * to: *

7.2.5 DEFINITION OF A NEW RULE SET ON LAYER 3

The configuration of rule sets for filter layer 3 will be described on the following pages.

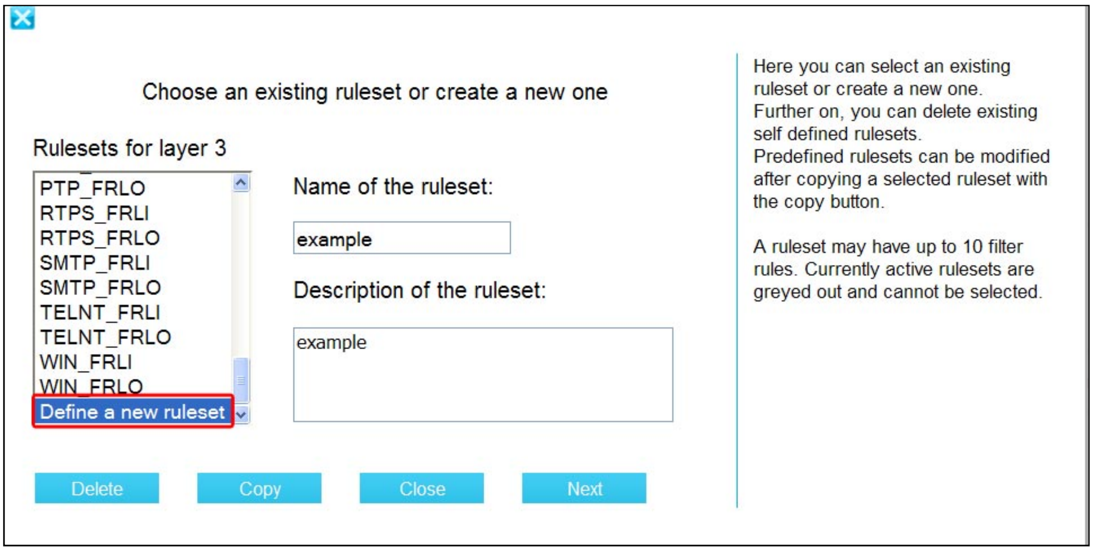
Note:

If you want to configure Layer 2 after the filter level, use the chapter ***„Define new rule set on bridged Ethernet interfaces (Layer 2)"*** *on the previous pages.*

Warning:

Before configuring a rule set on layer 3, ensure the option check box ***"Activate IP Router Functionality"****, located at the path* ***Basic Settings→ User Interface****. is checked. Confirm any modifications to this setting by selecting* ***"Activate"****.*

Select the menu item: **Define new rule set.**



Choose an existing ruleset or create a new one

Rulesets for layer 3

- PTP_FRLO
- RTPS_FRLI
- RTPS_FRLO
- SMTP_FRLI
- SMTP_FRLO
- TELNT_FRLI
- TELNT_FRLO
- WIN_FRLI
- WIN_FRLO
- Define a new ruleset

Name of the ruleset: example

Description of the ruleset: example

Here you can select an existing ruleset or create a new one. Further on, you can delete existing self defined rulesets. Predefined rulesets can be modified after copying a selected ruleset with the copy button.

A ruleset may have up to 10 filter rules. Currently active rulesets are greyed out and cannot be selected.

Click the **Add** button and subsequently select **Definition of a new Rule Set**.
Then assign a name and a description to the new rule set.

Note:

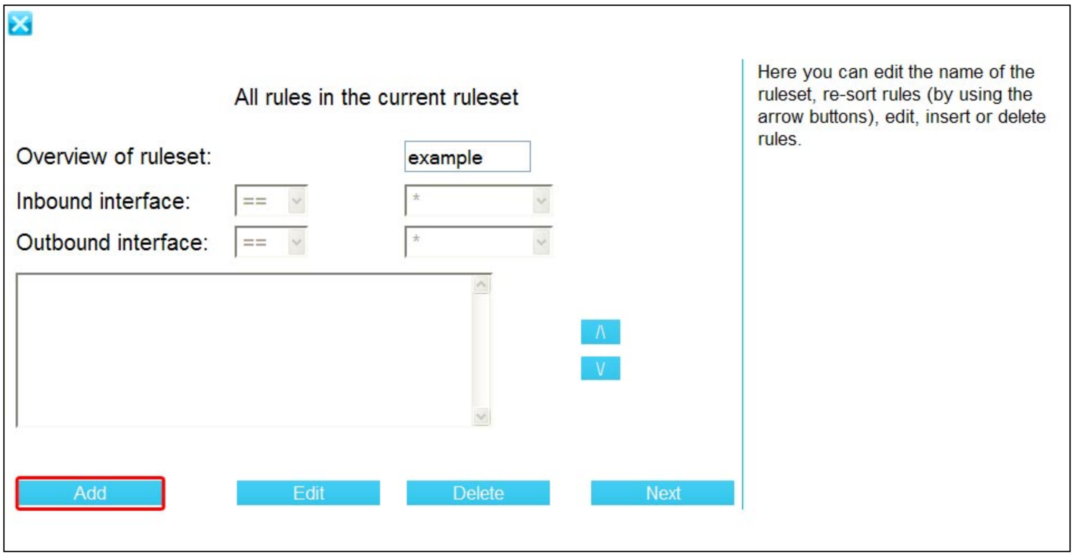
Use a different name for each rule set if possible. Do not use umlauts as they will lead to error messages.

Confirm by clicking **Next.**

Rule set Layer and Interfaces

The track of the packets is adjusted via the dialogue window, to which this rule set shall be applied. Both an inbound interface (where the packets come in) and an outbound interface (where the packets are to leave the device after having been accepted) are required.

Depending on configuration, the following additional interfaces are available on Layer 3: **L3-VPN** /**Service**/**IPsec**



All rules in the current ruleset

Overview of ruleset: example

Inbound interface: == *

Outbound interface: == *

Here you can edit the name of the ruleset, re-sort rules (by using the arrow buttons), edit, insert or delete rules.

Example:

Symbol	Interface	Action
==	Incoming interface: **HOST**	filters all inbound data packets on **HOST**
!=	Outgoing interface: **WLAN-2**	filters all outgoing data packets on all ports, **except for WLAN-2**

➔

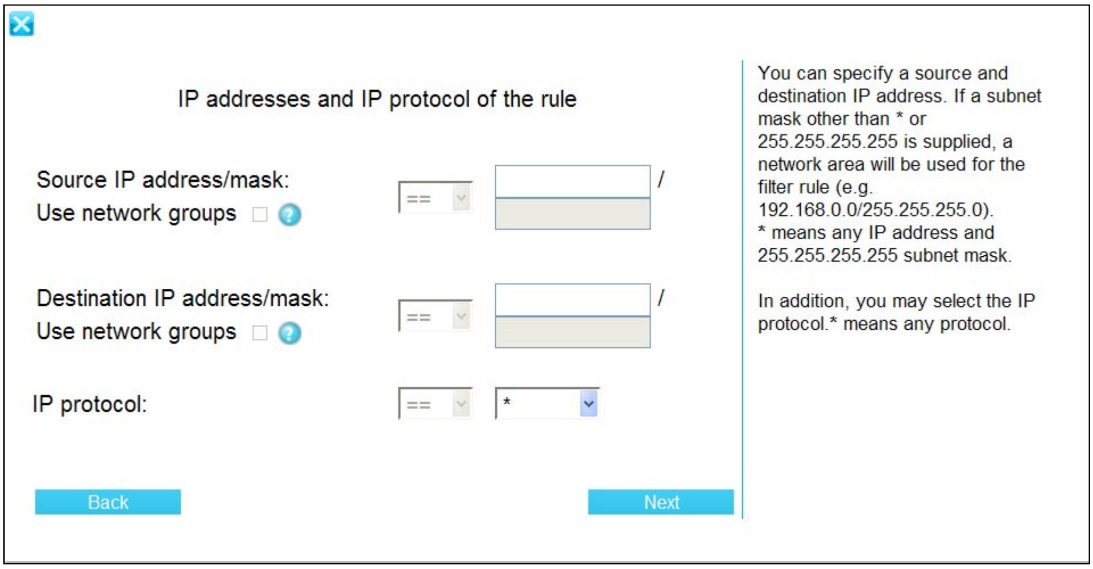
Note:

If you do not wish to filter particular ports, choose the default menu item (i.e. the asterisk item).

Confirm your input by clicking **Next**.

Rule-related Internet Protocols and IP Addresses

The **Source IP Address** defines the sender's address, and the **Target IP Address** defines the receiver's address.



You can specify a source and destination IP address. If a subnet mask other than * or 255.255.255.255 is supplied, a network area will be used for the filter rule (e.g. 192.168.0.0/255.255.255.0). * means any IP address and 255.255.255.255 subnet mask.

In addition, you may select the IP protocol.* means any protocol.

Note:
If the option "Use Network Groups" is activated, you may choose the added network groups. Use this option if you want to allocate rules to more than one IP address.

Note:
If you want to use a permanent connection between two defined devices, you may define the IP addresses of the respective devices here.

Note:
Once a specific protocol has been selected you may adjust protocol-specific configuration settings.

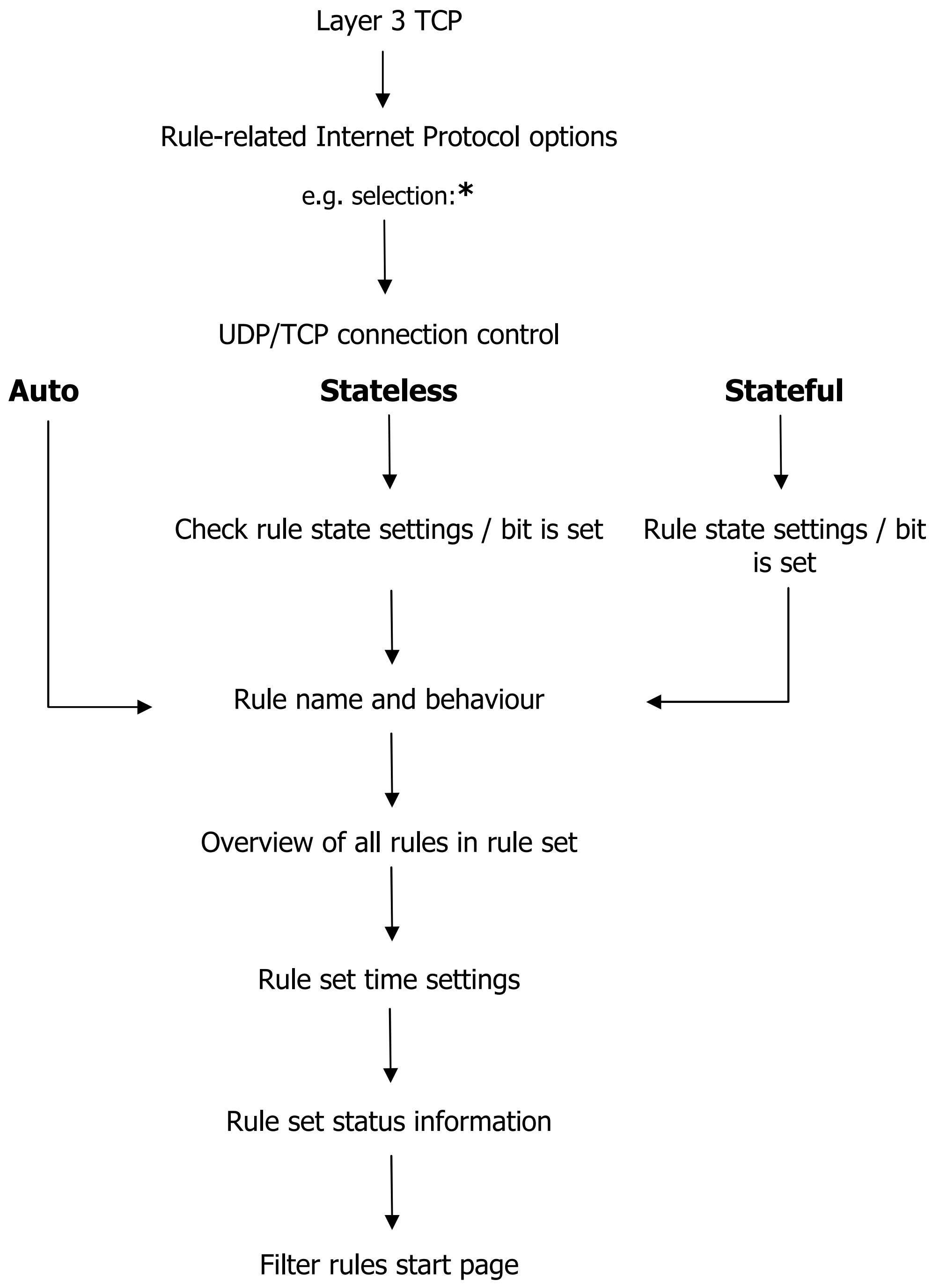
Internet Protocols:

PROTOCOL	DESCRIPTION
TCP	The Transmission Control Protocol (TCP) is a protocol defining the way in which streams of bytes are exchanged between computers. All current operating systems support TCP and employ it for exchanging data with other computers.
UDP	The User Datagram Protocol (UDP) is a minimal message-oriented network protocol that belongs to the transport layer of the Internet Protocol Suite. UDP is used to allow application-to-application communication via the internet.

ICMP	Like TCP and UDP, the Internet Control Message Protocol (ICMP) uses the Internet Protocol (IP) and is hence also part of the Internet Protocol Suite. It is chiefly used by networked computers' operating systems to send error and information messages.

The following overview shows the configuration options available for each protocol.

Menu Overview Layer 3 Selection TCP



Layer 3 TCP

Rule-related Internet Protocol options

e.g. selection:*

UDP/TCP connection control

Auto

Stateless

Stateful

Check rule state settings / bit is set

Rule state settings / bit is set

Rule name and behaviour

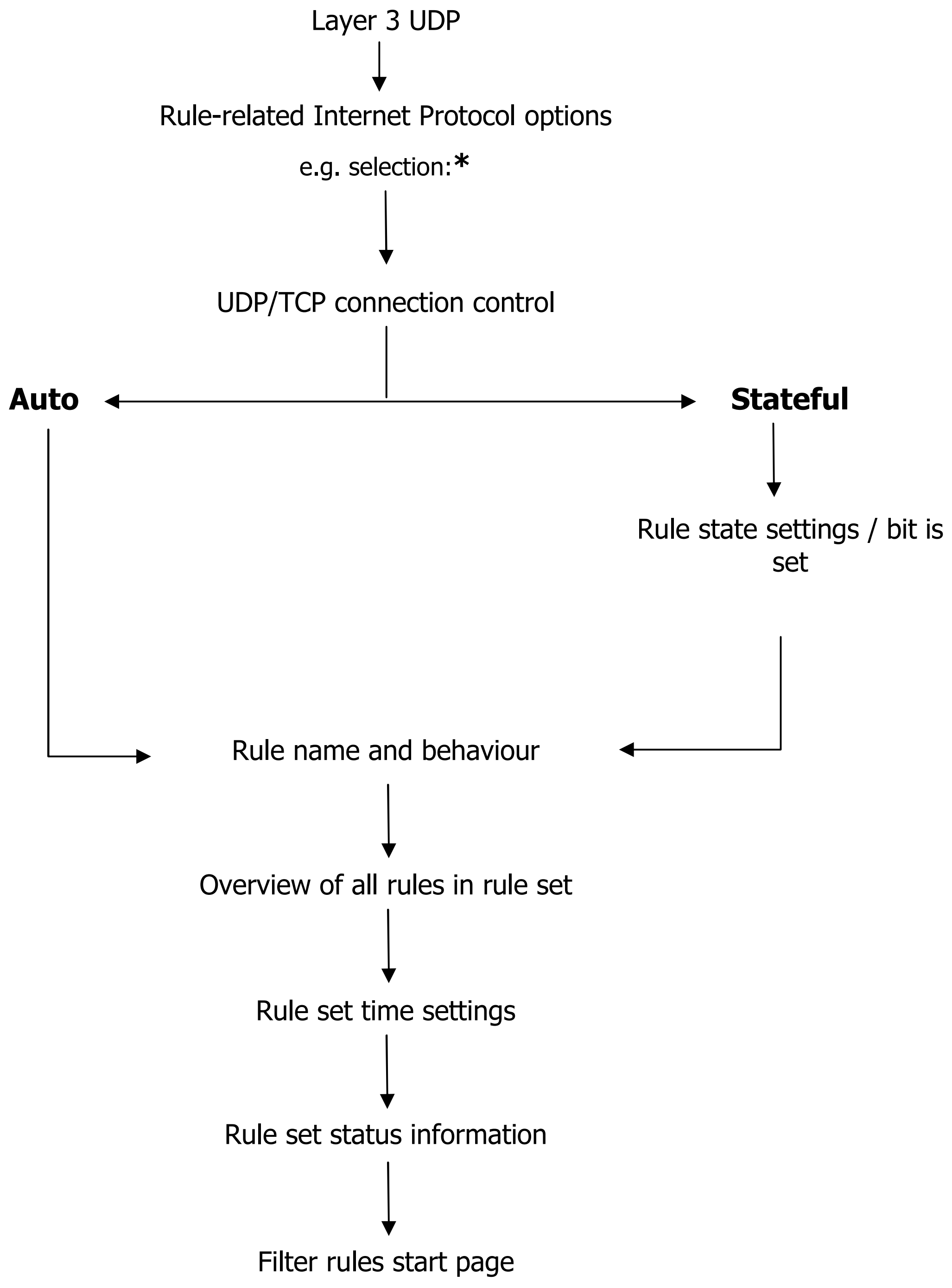
Overview of all rules in rule set

Rule set time settings

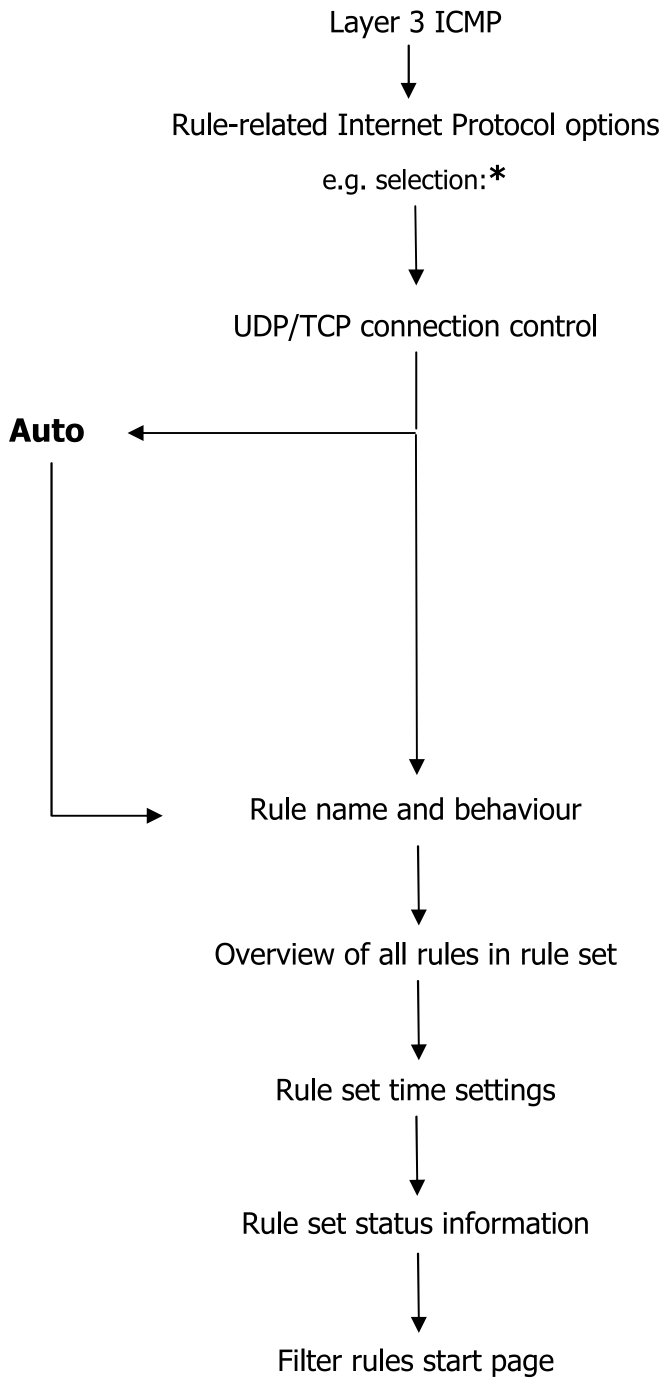
Rule set status information

Filter rules start page

MENU OVERVIEW LAYER 3 SELECTION UDP

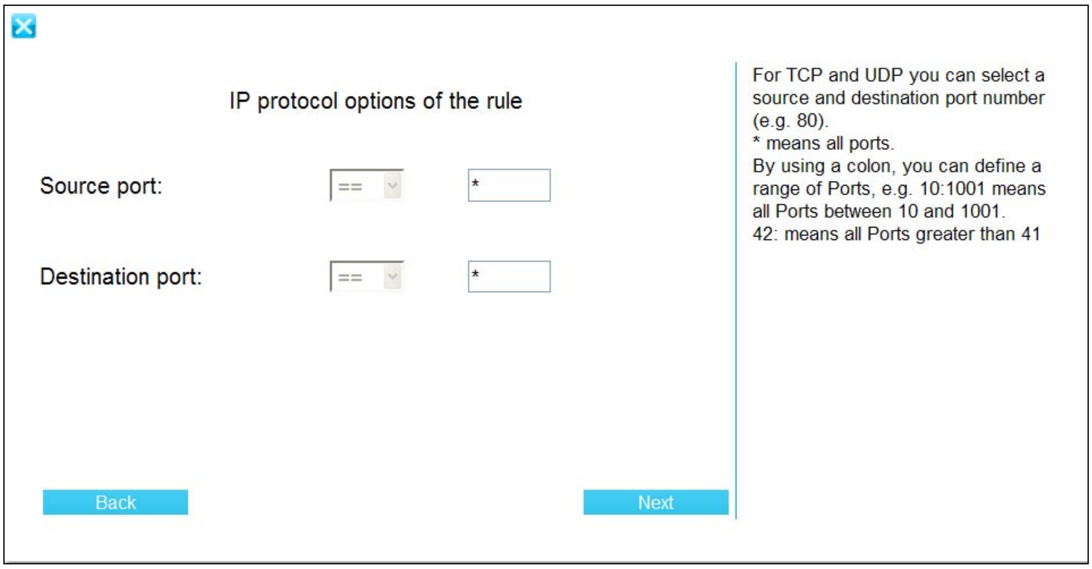

Layer 3 UDP
Rule-related Internet Protocol options
e.g. selection:*
UDP/TCP connection control
Auto
Stateful
Rule state settings / bit is set
Rule name and behaviour
Overview of all rules in rule set
Rule set time settings
Rule set status information
Filter rules start page

MENU OVERVIEW LAYER 3 SELECTION ICMP


Layer 3 ICMP
Rule-related Internet Protocol options
e.g. selection:*
UDP/TCP connection control
Auto
Rule name and behaviour
Overview of all rules in rule set
Rule set time settings
Rule set status information
Filter rules start page

EXEMPLARY CONFIGURATION – SELECTION TCP:

If TCP has been selected, the wizard will guide you through the following menus:



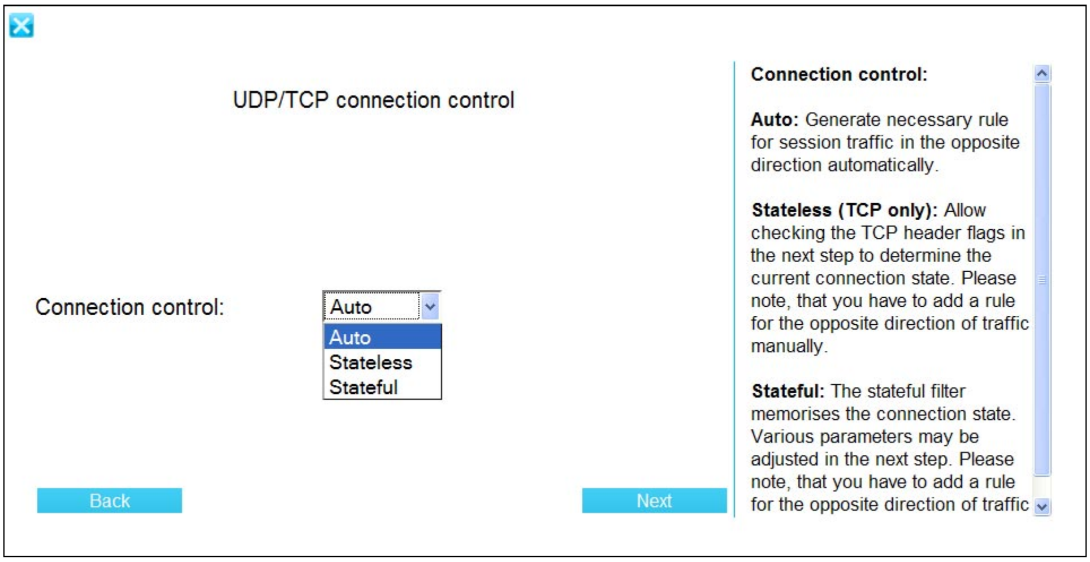
IP protocol options of the rule

Source port: == *

Destination port: == *

For TCP and UDP you can select a source and destination port number (e.g. 80).
* means all ports.
By using a colon, you can define a range of Ports, e.g. 10:1001 means all Ports between 10 and 1001.
42: means all Ports greater than 41

You may define source/target ports for TCP and UDP connections. In case you do not wish to define such ports, select **Next**.



UDP/TCP connection control

Connection control: Auto

Connection control:

Auto: Generate necessary rule for session traffic in the opposite direction automatically.

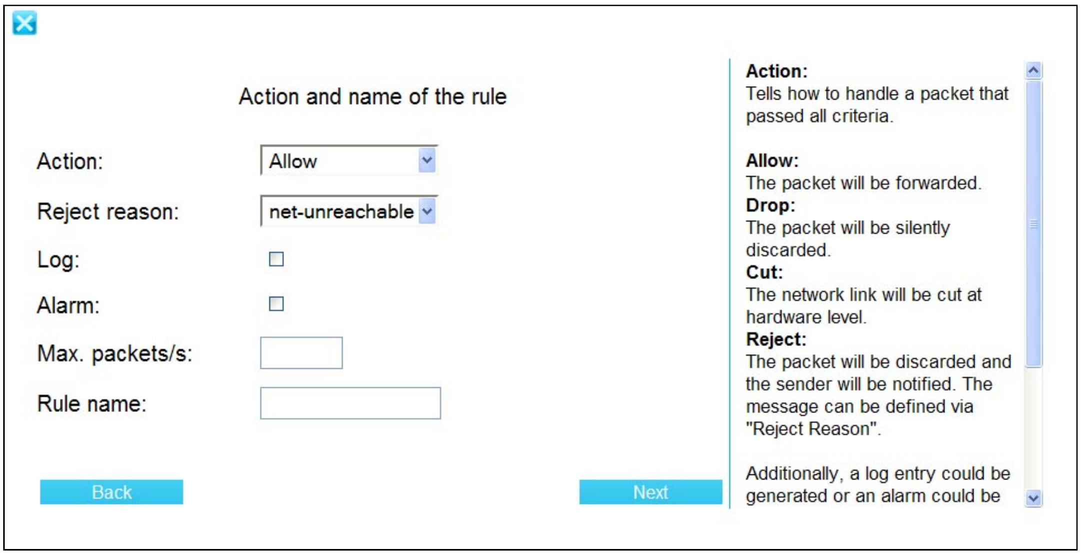
Stateless (TCP only): Allow checking the TCP header flags in the next step to determine the current connection state. Please note, that you have to add a rule for the opposite direction of traffic manually.

Stateful: The stateful filter memorises the connection state. Various parameters may be adjusted in the next step. Please note, that you have to add a rule for the opposite direction of traffic

A connection control may be configured for the TC protocol. Available options are Auto, Stateless and Stateful.

AUTO

If **Auto** is selected, clicking **Next** will take you to the **Rule Name and Behaviour** menu.



Action and name of the rule

Action:	Allow
Reject reason:	net-unreachable
Log:	□
Alarm:	□
Max. packets/s:	
Rule name:	

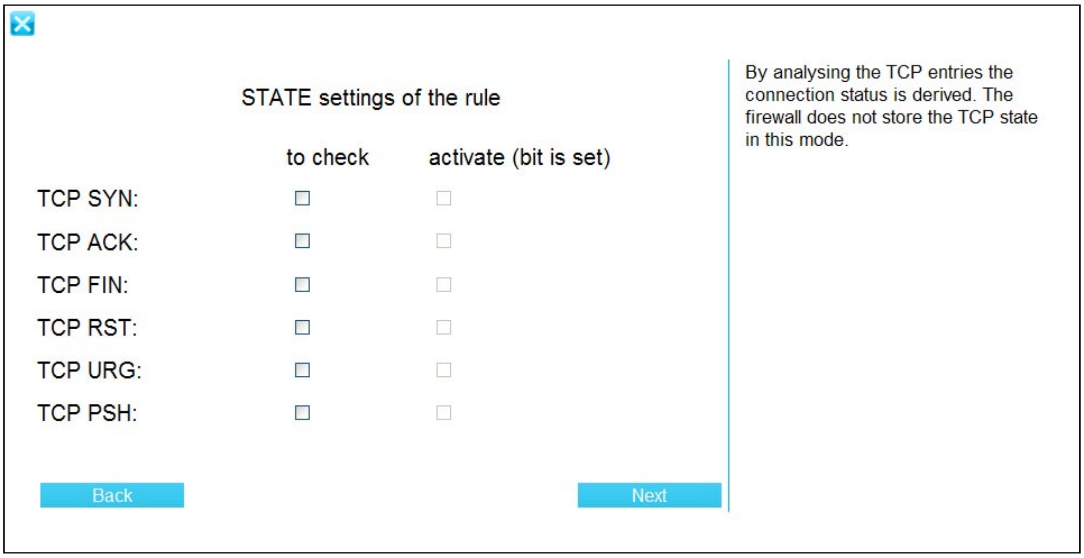
Action:
Tells how to handle a packet that passed all criteria.

Allow:
The packet will be forwarded.
Drop:
The packet will be silently discarded.
Cut:
The network link will be cut at hardware level.
Reject:
The packet will be discarded and the sender will be notified. The message can be defined via "Reject Reason".

Additionally, a log entry could be generated or an alarm could be

STATELESS:

With this option activated, the TCP headers containing information on the connection status will be analysed.



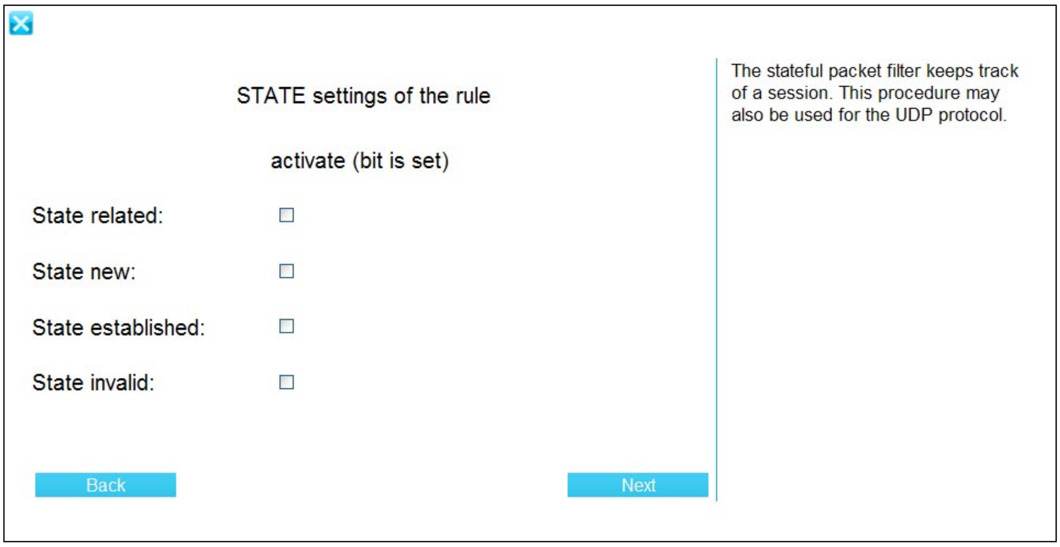
STATE settings of the rule

	to check	activate (bit is set)
TCP SYN:	□	□
TCP ACK:	□	□
TCP FIN:	□	□
TCP RST:	□	□
TCP URG:	□	□
TCP PSH:	□	□

By analysing the TCP entries the connection status is derived. The firewall does not store the TCP state in this mode.

STATEFUL:

The stateful packet filter monitors all session-related connection information.



STATE settings of the rule

activate (bit is set)

State related: □

State new: □

State established: □

State invalid: □

The stateful packet filter keeps track of a session. This procedure may also be used for the UDP protocol.

State Related: Data packet is assigned to existing data connection, e.g. for establishing an FTP feedback channel.

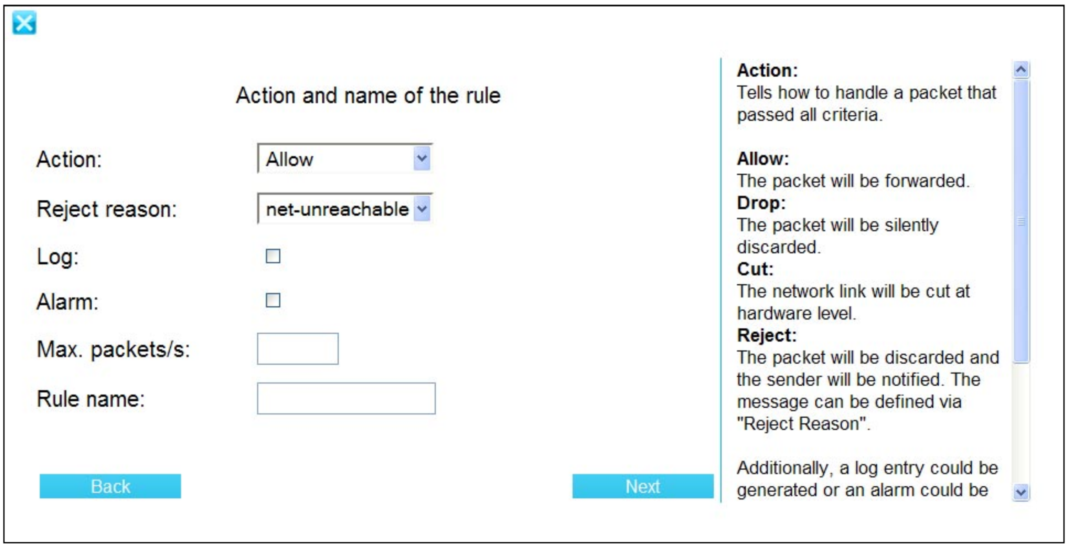
State New: Data packet establishes a new data connection, e.g. TCP with SYN flag.

State Established: Data packet belongs directly to specific data connection, e.g. TCP data without SYN flag.

State Invalid: Data packets for which the firewall could not determine a valid connection state.

RULE NAME AND BEHAVIOUR

The action of the rule can be defined in the dialogue window. Under Action for the Rule menu item, you may specify how the device has to handle a packet. Further, it is possible to log the events, to release an alarm and to restrict the data throughput.



Action and name of the rule

Action: Allow

Reject reason: net-unreachable

Log: □

Alarm: □

Max. packets/s:

Rule name:

Action:
Tells how to handle a packet that passed all criteria.

Allow:
The packet will be forwarded.
Drop:
The packet will be silently discarded.
Cut:
The network link will be cut at hardware level.
Reject:
The packet will be discarded and the sender will be notified. The message can be defined via "Reject Reason".

Additionally, a log entry could be generated or an alarm could be

Confirm your input by clicking **Next**. **Aktion für die Regel**:
Zur Auswahl stehen:

Zulassen: Das Paket wird weitergeleitet.

Verwerfen: Das Paket wird ohne Nachricht an den Absender gelöscht.

Abweisungsgrund:
Hier kann der Abweisungsgrund definiert werden, der dem Absender gemeldet wird.

Log:
Es wird ein Eintrag im Eventlog protokolliert.

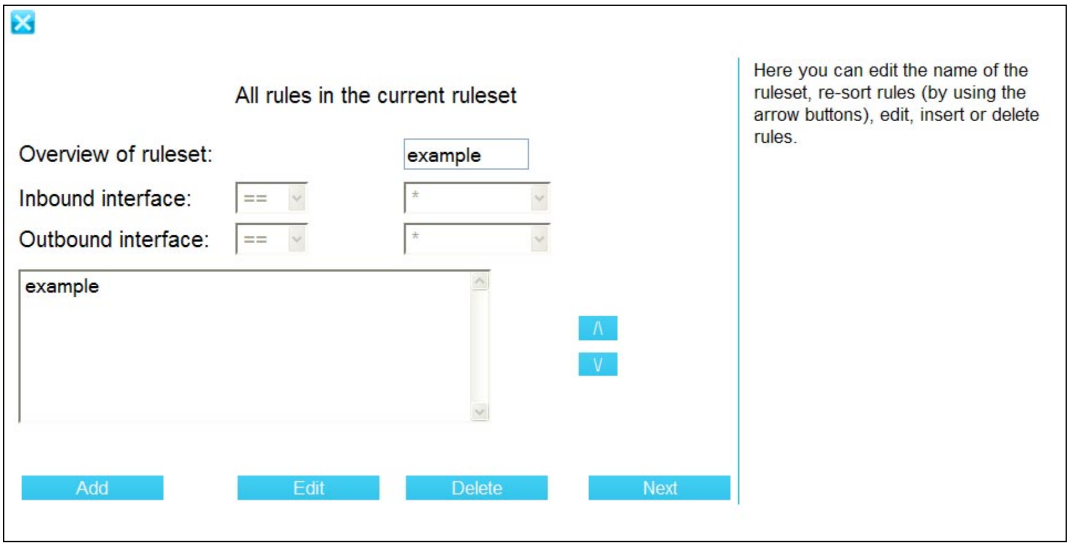
Alarm:
Es wird der Alarmausgang gesetzt.

Max.Pakete/Sek:
Hier kann die maximale Paketrate pro Sekunde festgelegt werden, die als Obergrenze gegen einen Denial-of-Service eingestellt werden kann. Dies ist ebenfalls sinnvoll, um Regeln die in einem häufigen Intervall einen Eventlogeintrag erzeugen würden, zu begrenzen

Name der Regel:
Definieren Sie einen eindeutigen Regelnamen. Es ist zwingend notwendig, dass Sie einen Namen für die Regel des Regelsets vergeben.

Bestätigen Sie mit: **Weiter**

OVERVIEW OF ALL RULES IN RULE SET



All rules in the current ruleset

Overview of ruleset: example

Inbound interface: == *

Outbound interface: == *

example

Here you can edit the name of the ruleset, re-sort rules (by using the arrow buttons), edit, insert or delete rules.

MATRIX OF ALL RULES OF A RULE SET:

The dialogue window displays the various rules of the rule set. The sequence of them can be changed. Further, the rule set name can be changed.

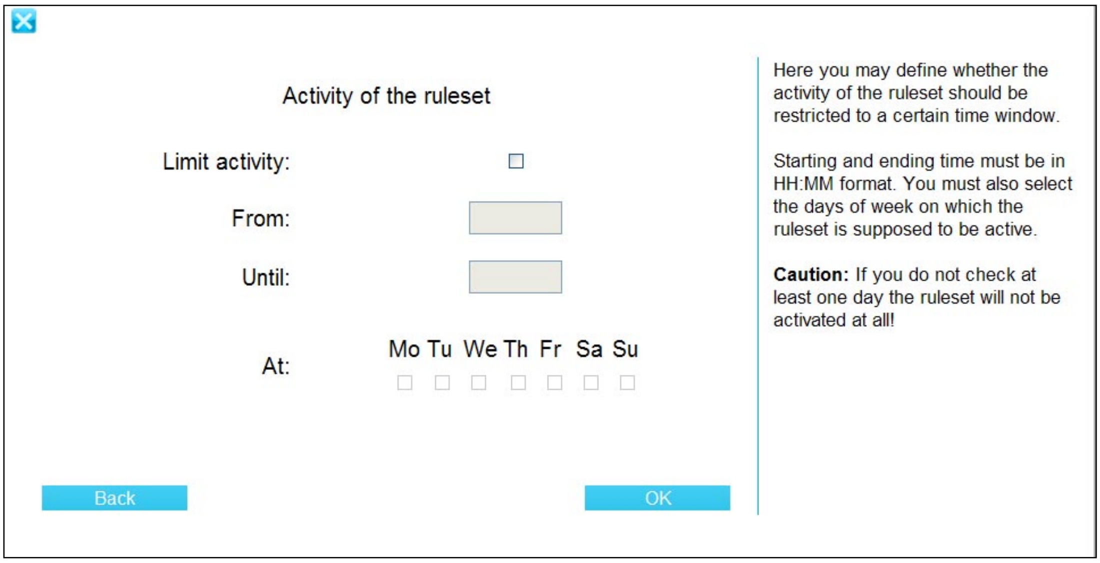
The set-up process is restarted by clicking on the **Add** button, and a new rule can be defined. By means of the **Process** button, rules already defined can be changed later.

Select **Delete** to delete the marked rule.

By means of the arrow buttons, the position of a rule within the current rule set can be changed.

Confirm with **Continue**

RULE SET TIME SETTINGS



Activity of the ruleset

Limit activity: □

From:

Until:

At: Mo □ Tu □ We □ Th □ Fr □ Sa □ Su □

Here you may define whether the activity of the ruleset should be restricted to a certain time window.

Starting and ending time must be in HH:MM format. You must also select the days of week on which the ruleset is supposed to be active.

Caution: If you do not check at least one day the ruleset will not be activated at all!

Note:

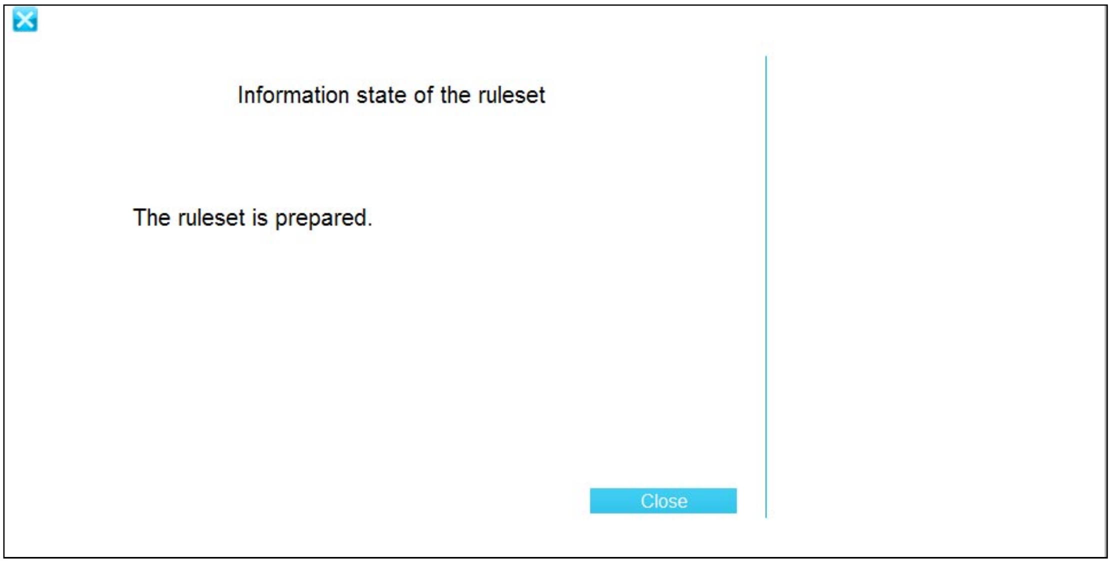
If the validity is restricted, there must be stated at least one weekday, otherwise the rule will be invalid and not be used

Note:

Irrespective of the time zone configuration of the device, the validity periods must be configured in consideration of the UTC time!

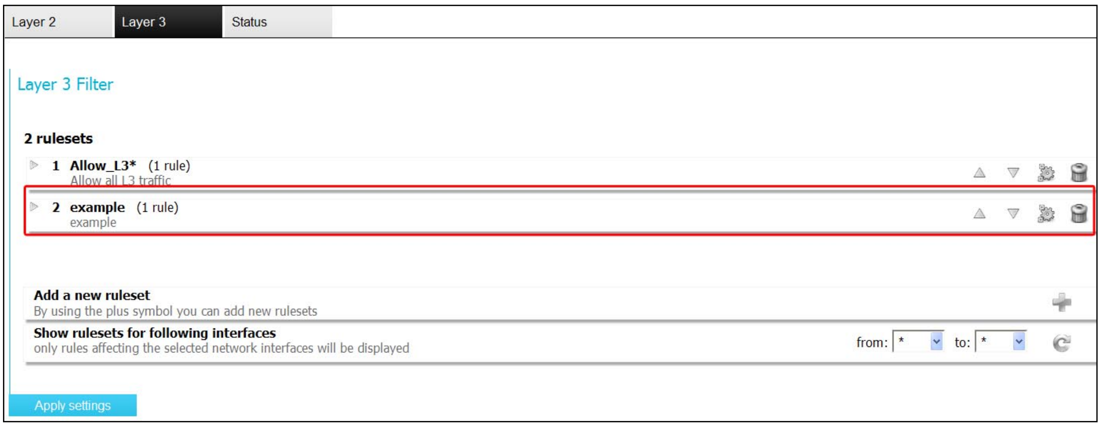
Complete the configuration by clicking **Save.**

Confirm the next message prompt by clicking **Close.**



Information state of the ruleset

The ruleset is prepared.



Layer 3 Filter

2 rulesets

1 Allow_L3* (1 rule)
Allow all L3 traffic

2 example (1 rule)
example

Add a new ruleset
By using the plus symbol you can add new rulesets

Show rulesets for following interfaces
only rules affecting the selected network interfaces will be displayed

from: * to: *

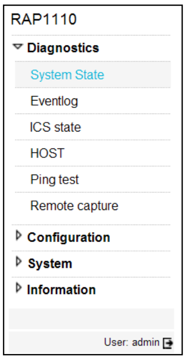
Apply settings

Once a rule set has been successfully loaded and activated, it will be shown in the filter overview page.

This completes the first-time configuration using the configuration wizards.

8 Access Point/Client Web Interface

The Access Point Web Interface is structured in five main menu items.



Diagnostics

Shows the current interface status

Configuration

Configures the Access Point specific functions

System

Allows basic settings and changes in the web interface

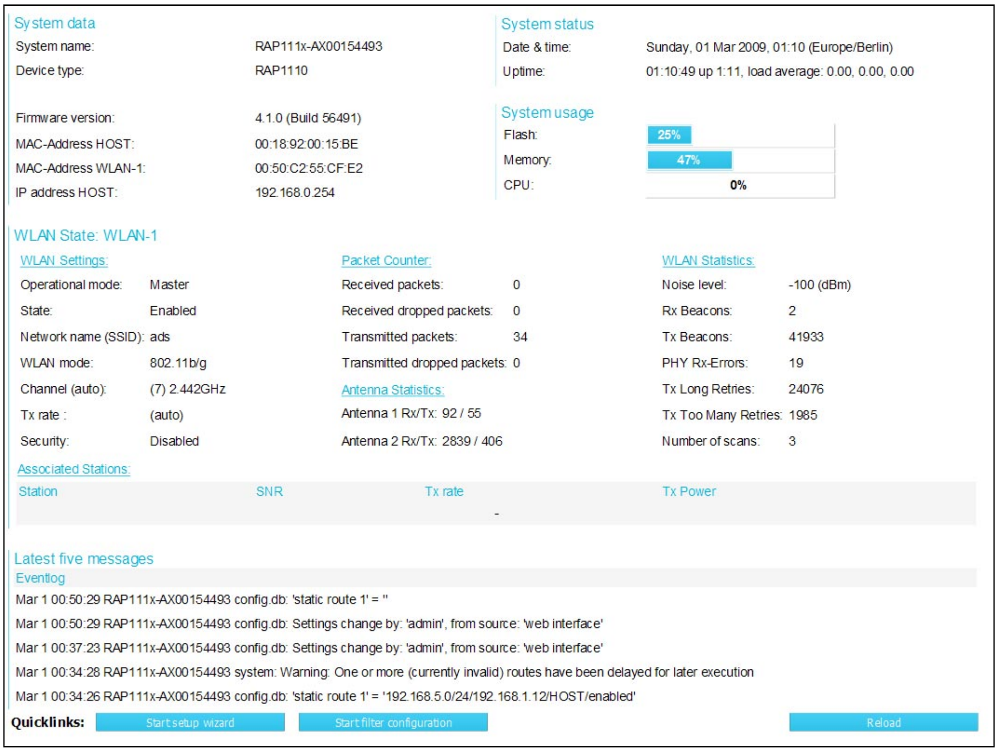
Information

Contains general information with respect to this device

8.1 Diagnostics main menu item

8.1.1 System status

The web interface start page shows all important Access Point settings at a glance. Functions can be selected directly via hyperlinks from the start page.



System data

System name:	RAP111x-AX00154493
Device type:	RAP1110
Firmware version:	4.1.0 (Build 56491)
MAC-Address HOST:	00:18:92:00:15:BE
MAC-Address WLAN-1:	00:50:C2:55:CF:E2
IP address HOST:	192.168.0.254

System status

Date & time:	Sunday, 01 Mar 2009, 01:10 (Europe/Berlin)
Uptime:	01:10:49 up 1:11, load average: 0.00, 0.00, 0.00

System usage

Flash:	25%
Memory:	47%
CPU:	0%

WLAN State: WLAN-1

WLAN Settings:

Operational mode:	Master
State:	Enabled
Network name (SSID):	ads
WLAN mode:	802.11b/g
Channel (auto):	(7) 2.442GHz
Tx rate :	(auto)
Security:	Disabled

Packet Counter:

Received packets:	0
Received dropped packets:	0
Transmitted packets:	34
Transmitted dropped packets:	0

Antenna Statistics:

Antenna 1 Rx/Tx: 92 / 55

Antenna 2 Rx/Tx: 2839 / 406

WLAN Statistics:

Noise level:	-100 (dBm)
Rx Beacons:	2
Tx Beacons:	41933
PHY Rx-Errors:	19
Tx Long Retries:	24076
Tx Too Many Retries:	1985
Number of scans:	3

Associated Stations:

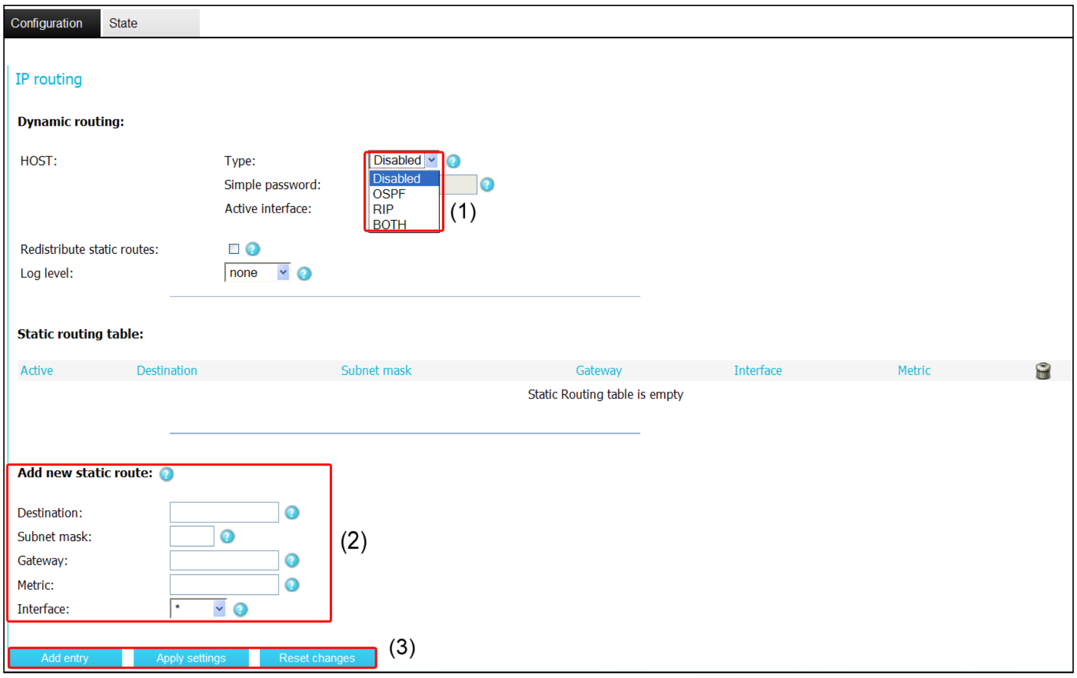
Station	SNR	Tx rate	Tx Power
		-	

Latest five messages

Eventlog

```
Mar 1 00:50:29 RAP111x-AX00154493 config.db: 'static route 1' = ''
Mar 1 00:50:29 RAP111x-AX00154493 config.db: Settings change by: 'admin', from source: 'web interface'
Mar 1 00:37:23 RAP111x-AX00154493 config.db: Settings change by: 'admin', from source: 'web interface'
Mar 1 00:34:28 RAP111x-AX00154493 system: Warning: One or more (currently invalid) routes have been delayed for later execution
Mar 1 00:34:26 RAP111x-AX00154493 config.db: 'static route 1' = '192.168.5.0/24/192.168.1.12/HOST/enabled'
```

8.2 General overview for configuration in the menus



IP routing

Dynamic routing:

HOST:

Type: Disabled

Simple password:

Active interface:

Redistribute static routes: □

Log level: none

Static routing table:

Active	Destination	Subnet mask	Gateway	Interface	Metric

Static Routing table is empty

Add new static route:

Destination:

Subnet mask:

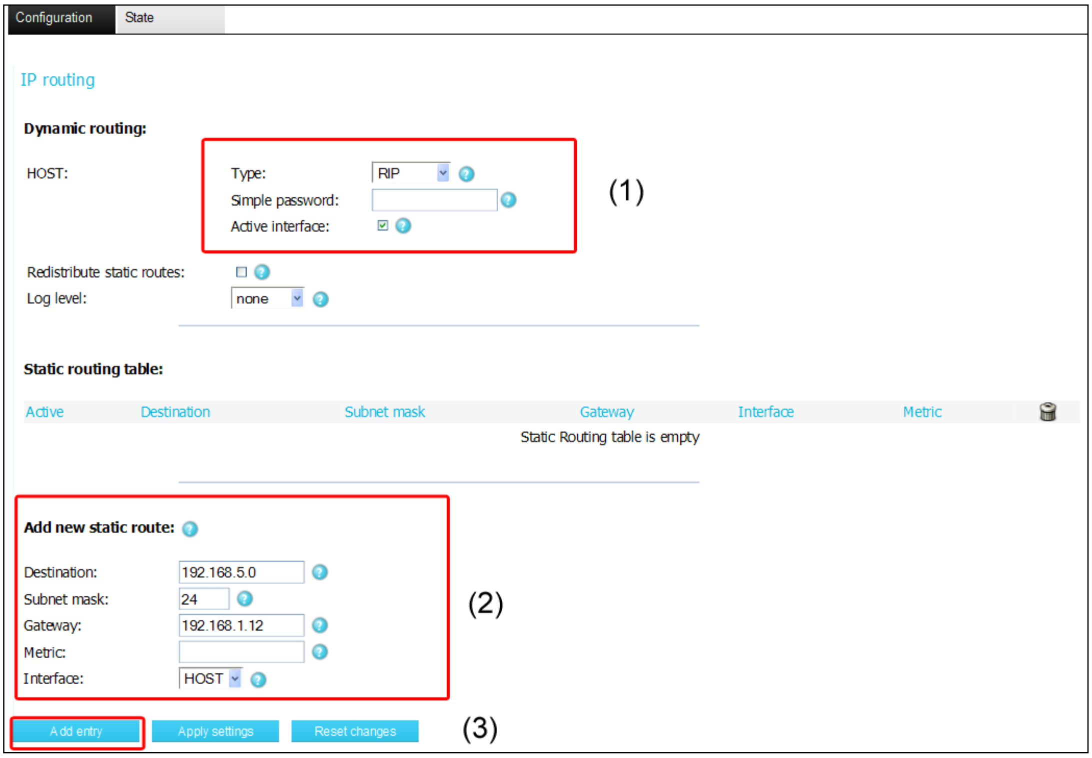
Gateway:

Metric:

Interface: *

8.2.1 IP ROUTING EXEMPLARY CONFIGURATION

This example shows, by means of the IP routing menu item, how a setting is made and stored. Furthermore it explains how a certain setting is disabled or deleted.



IP routing

Dynamic routing:

HOST:
Type: RIP
Simple password:
Active interface: ☑

Redistribute static routes: □
Log level: none

Static routing table:

Active	Destination	Subnet mask	Gateway	Interface	Metric

Static Routing table is empty

Add new static route:

Destination: 192.168.5.0
Subnet mask: 24
Gateway: 192.168.1.12
Metric:
Interface: HOST

> ***Note:***
> *If you don't know exactly, which setting is the correct one in a specific selection / input box, you can put the mouse pointer on the question mark right next to this selection. A tooltip box will appear, giving you some advice and explanation, including some examples.*

SELECTION 1

Make a selection in the pull down menu first. Click on the arrow next to the setting in order to make a selection.

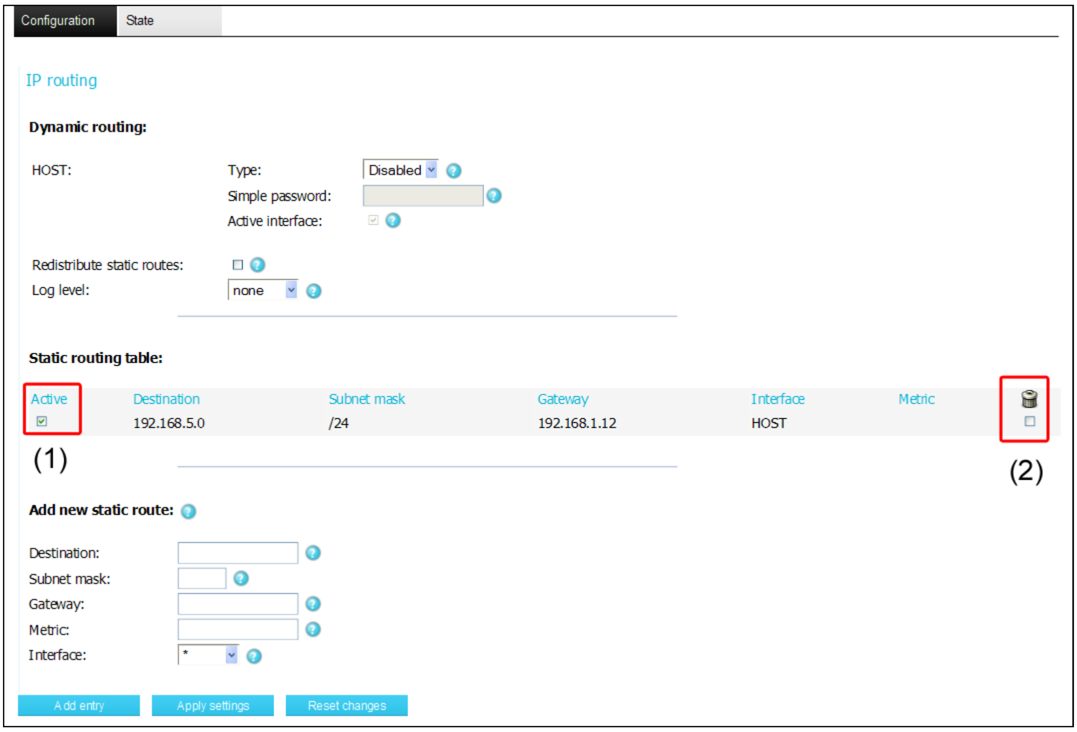
SELECTION 2

Subsequently, enter all user specific settings in the input boxes.

SELECTION 3

Confirm your entry by clicking on "**Add entry**". Your settings will now be stored.

Your settings are stored and enabled now. (Tick at no. 1)



IP routing

Dynamic routing:

HOST:

Type: Disabled

Simple password:

Active interface: ☑

Redistribute static routes: □

Log level: none

Static routing table:

Active	Destination	Subnet mask	Gateway	Interface	Metric	🗑
☑	192.168.5.0	/24	192.168.1.12	HOST		□

Add new static route:

Destination:

Subnet mask:

Gateway:

Metric:

Interface: *

Selection 1

Remove the tick at no. 1 and select "**Apply settings**" if you want to disable a currently enabled setting. This setting is disabled now.

Selection 2

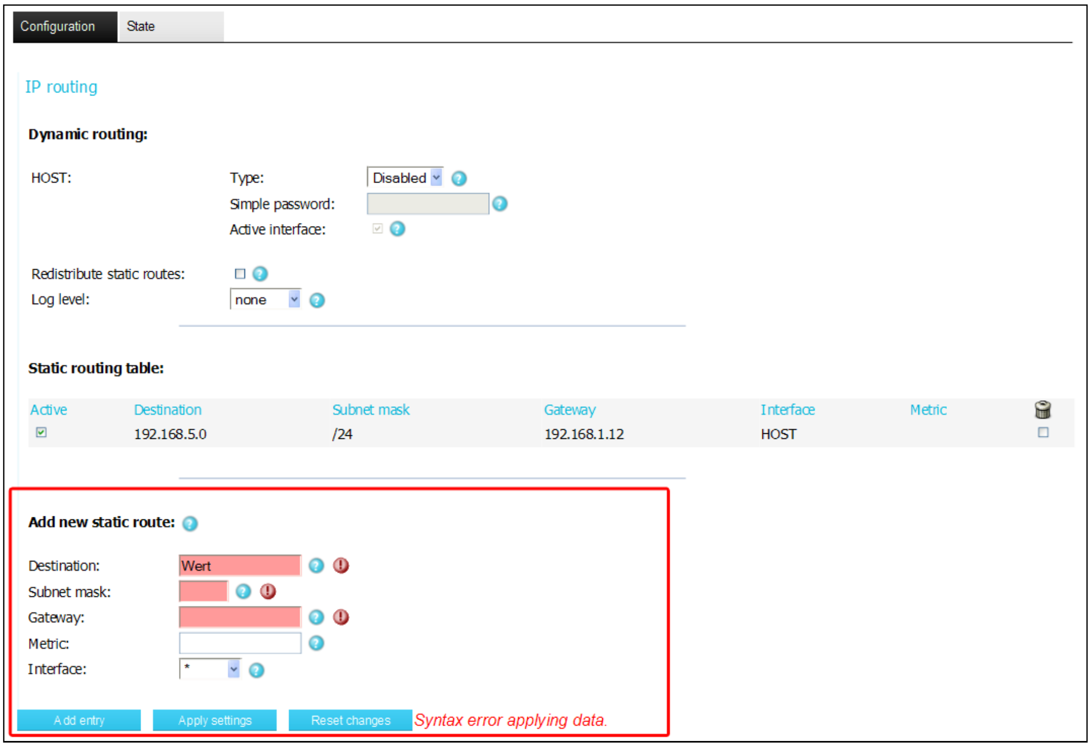
Tick the box at no. 2 and select "**Apply settings**" in order to delete a certain setting.

Note:

The "Reset changes" button in the task bar allows to reset settings you made earlier to the default value.

8.2.2 Error messages

The firewall identifies wrong entries by highlighting the affected input box in red.



IP routing

Dynamic routing:

HOST:
Type: Disabled
Simple password:
Active interface: ☑

Redistribute static routes: □
Log level: none

Static routing table:

Active	Destination	Subnet mask	Gateway	Interface	Metric	
☑	192.168.5.0	/24	192.168.1.12	HOST		□

Add new static route:

Destination: Wert
Subnet mask:
Gateway:
Metric:
Interface: *

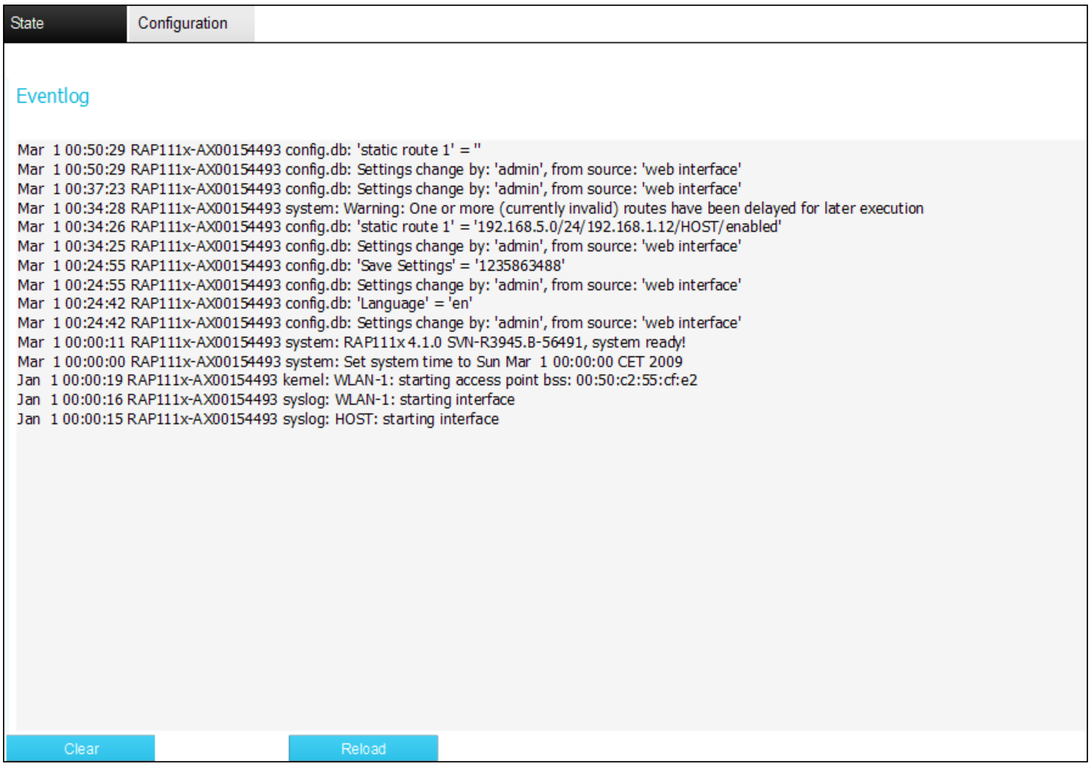
Syntax error applying data.

Note:
By means of the exclamation mark next to the wrong entry you can identify what the reason for this error might be, or which values might be required.

8.2.3 Eventlog

State

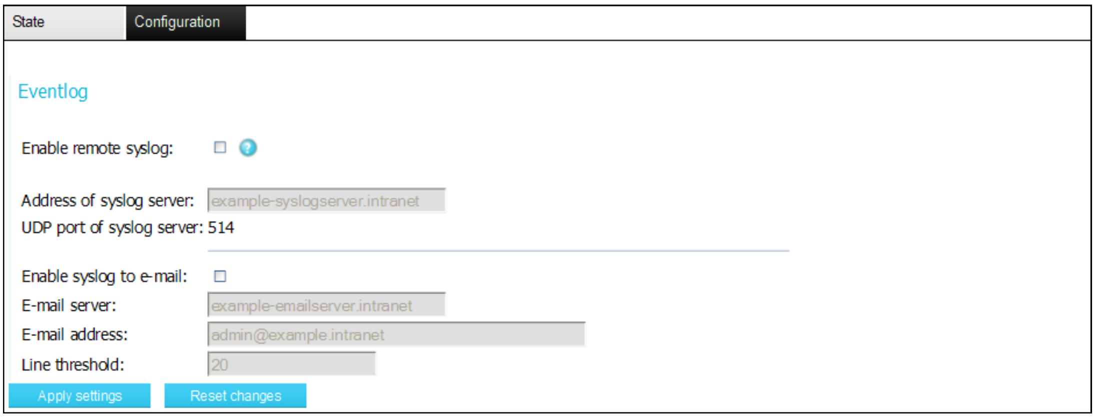
The Eventlog represents the most important diagnostics tool of this device and contains essential information about the system status. Potential system error messages will be entered and displayed here. The Eventlog display acts like a protocol and records all system activities. In the Eventlog, you can view changes in settings and error messages as a protocol.



```
Mar  1 00:50:29 RAP111x-AX00154493 config.db: 'static route 1' = ''
Mar  1 00:50:29 RAP111x-AX00154493 config.db: Settings change by: 'admin', from source: 'web interface'
Mar  1 00:37:23 RAP111x-AX00154493 config.db: Settings change by: 'admin', from source: 'web interface'
Mar  1 00:34:28 RAP111x-AX00154493 system: Warning: One or more (currently invalid) routes have been delayed for later execution
Mar  1 00:34:26 RAP111x-AX00154493 config.db: 'static route 1' = '192.168.5.0/24/192.168.1.12/HOST/enabled'
Mar  1 00:34:25 RAP111x-AX00154493 config.db: Settings change by: 'admin', from source: 'web interface'
Mar  1 00:24:55 RAP111x-AX00154493 config.db: 'Save Settings' = '1235863488'
Mar  1 00:24:55 RAP111x-AX00154493 config.db: Settings change by: 'admin', from source: 'web interface'
Mar  1 00:24:42 RAP111x-AX00154493 config.db: 'Language' = 'en'
Mar  1 00:24:42 RAP111x-AX00154493 config.db: Settings change by: 'admin', from source: 'web interface'
Mar  1 00:00:11 RAP111x-AX00154493 system: RAP111x 4.1.0 SVN-R3945.B-56491, system ready!
Mar  1 00:00:00 RAP111x-AX00154493 system: Set system time to Sun Mar  1 00:00:00 CET 2009
Jan  1 00:00:19 RAP111x-AX00154493 kernel: WLAN-1: starting access point bss: 00:50:c2:55:cf:e2
Jan  1 00:00:16 RAP111x-AX00154493 syslog: WLAN-1: starting interface
Jan  1 00:00:15 RAP111x-AX00154493 syslog: HOST: starting interface
```

Configuration

The Eventlog protocol can also conveniently be sent to a central computer. In order to do this, the remote computer will be entered in the input boxes.



Enable remote syslog: □

Address of syslog server: example-syslogserver.intranet

UDP port of syslog server: 514

Enable syslog to e-mail: □

E-mail server: example-emailserver.intranet

E-mail address: admin@example.intranet

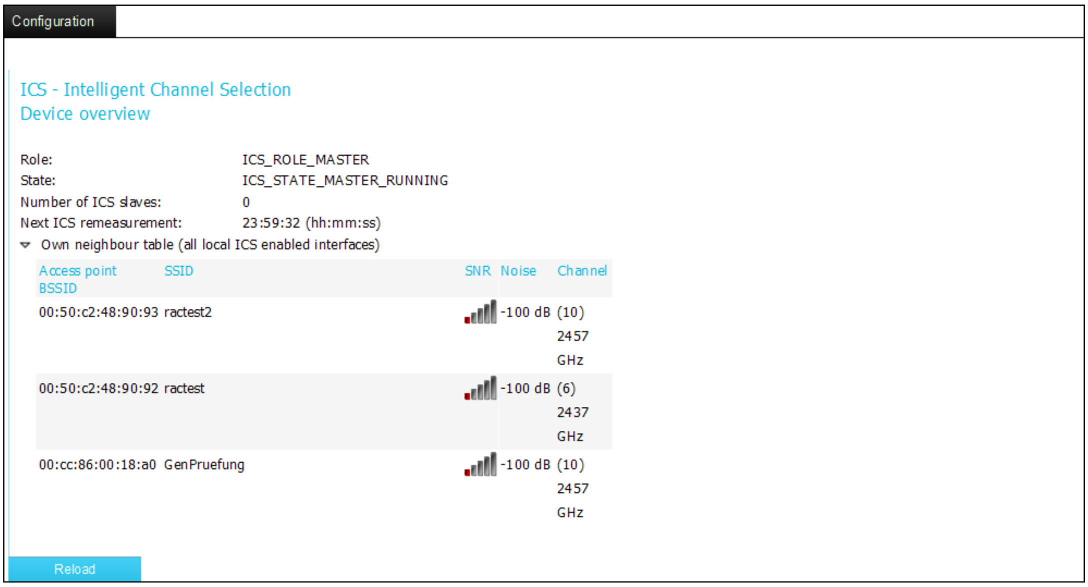
Line threshold: 20

Additionally, syslog messages can be sent by email. To do this, specify the IP-address of your E-mail server and a receiver E-mail address.

Note:

In order to avoid high data volumes due to emails, a suitable threshold value should be entered in the Line threshold box. The Line threshold specifies the number of lines which will be sent together in one email if the threshold value is reached.

8.2.4 ICS-Status



ICS - Intelligent Channel Selection
Device overview

Role: ICS_ROLE_MASTER
State: ICS_STATE_MASTER_RUNNING
Number of ICS slaves: 0
Next ICS remeasurement: 23:59:32 (hh:mm:ss)
Own neighbour table (all local ICS enabled interfaces)

Access point BSSID	SSID	SNR	Noise	Channel
00:50:c2:48:90:93	ractest2		-100 dB	(10) 2457 GHz
00:50:c2:48:90:92	ractest		-100 dB	(6) 2437 GHz
00:cc:86:00:18:a0	GenPruefung		-100 dB	(10) 2457 GHz

The menu item ICS Status gives information on all neighbouring network structures. They can be displayed in detail via **Own Neighbour Table**.

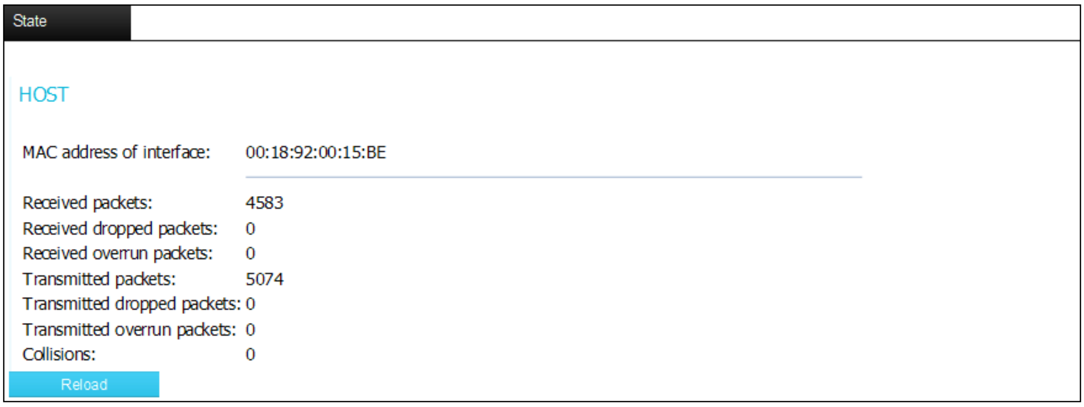
Note:

*To activate the ICS function, the **ICS** setting must be activated under **Configuration → WLAN-1/2-Parameters → Channel***

Note:

Further information on the mode of operation of the ICS is given in the WLAN Configuration chapter.

8.2.5 HOST



HOST

MAC address of interface: 00:18:92:00:15:BE

Received packets: 4583
Received dropped packets: 0
Received overrun packets: 0
Transmitted packets: 5074
Transmitted dropped packets: 0
Transmitted overrun packets: 0
Collisions: 0

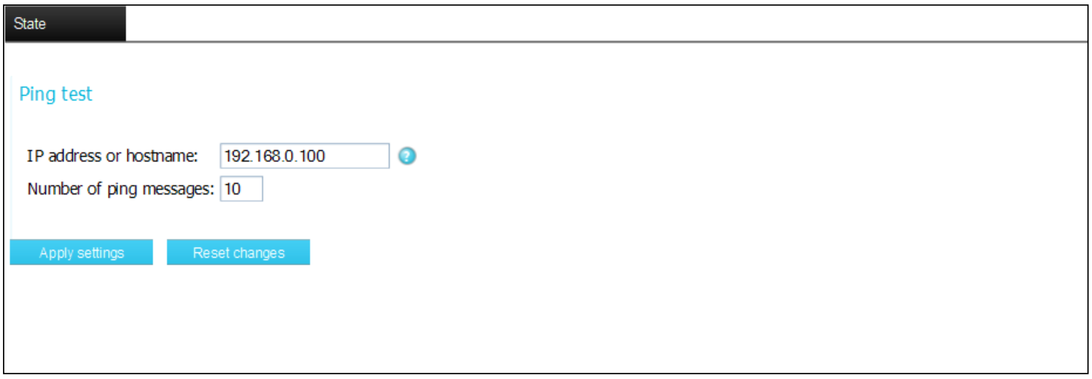
Based on the data, how the packets have been received or sent, can be traced back exactly. The display can be updated by using the Reload button.

8.2.6 PING TEST

By using the Ping test option you can check if a connected remote station can be reached or not. The Ping test sends an echo request packet to the destination address of the remote station to be tested and evaluates the test information.

Please enter the destination address to be tested in form of an IP-address in the designated box. Additionally, the Number of ping messages to be sent must be specified. It is limited to 10 packets.

By clicking on the **Apply settings** button the ping test will start.

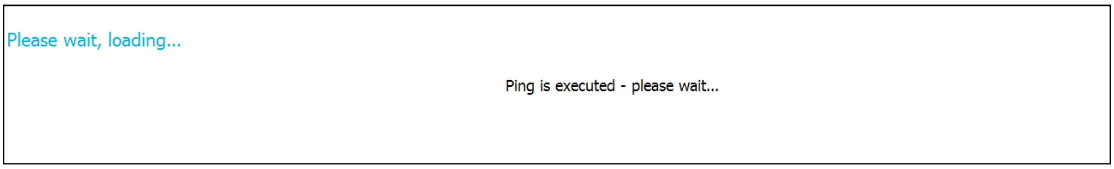


Ping test

IP address or hostname: 192.168.0.100

Number of ping messages: 10

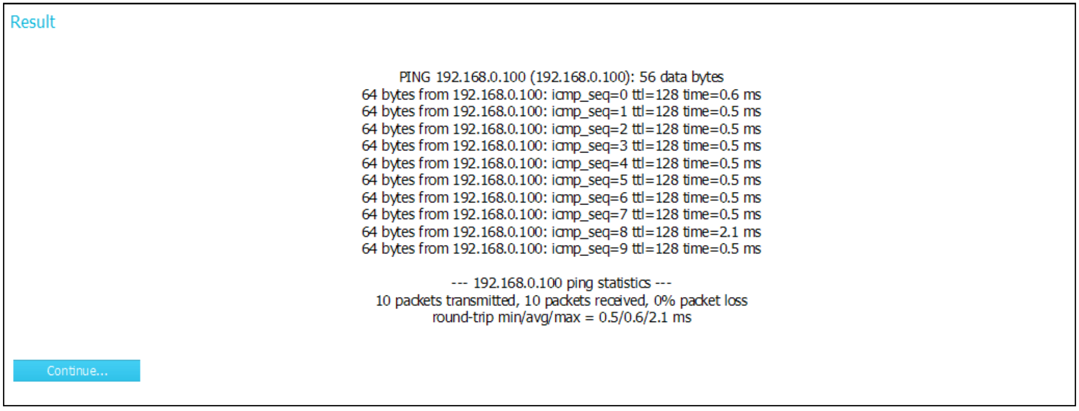
After a short time an overview will appear which shows the ping test process steps and result. The overview indicates both the sent and the received packet status.



Please wait, loading...

Ping is executed - please wait...

The Ping test is finished by pressing the Continue button.

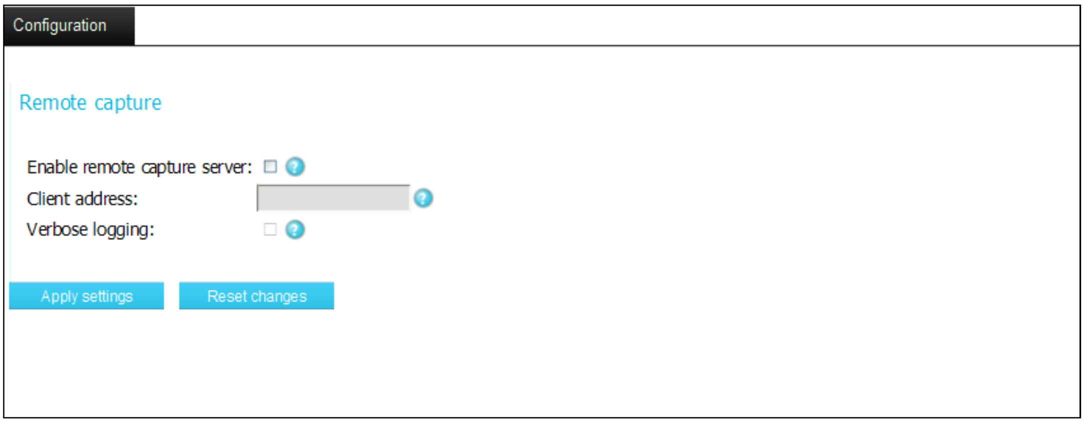


Result

```
PING 192.168.0.100 (192.168.0.100): 56 data bytes
64 bytes from 192.168.0.100: icmp_seq=0 ttl=128 time=0.6 ms
64 bytes from 192.168.0.100: icmp_seq=1 ttl=128 time=0.5 ms
64 bytes from 192.168.0.100: icmp_seq=2 ttl=128 time=0.5 ms
64 bytes from 192.168.0.100: icmp_seq=3 ttl=128 time=0.5 ms
64 bytes from 192.168.0.100: icmp_seq=4 ttl=128 time=0.5 ms
64 bytes from 192.168.0.100: icmp_seq=5 ttl=128 time=0.5 ms
64 bytes from 192.168.0.100: icmp_seq=6 ttl=128 time=0.5 ms
64 bytes from 192.168.0.100: icmp_seq=7 ttl=128 time=0.5 ms
64 bytes from 192.168.0.100: icmp_seq=8 ttl=128 time=2.1 ms
64 bytes from 192.168.0.100: icmp_seq=9 ttl=128 time=0.5 ms

--- 192.168.0.100 ping statistics ---
10 packets transmitted, 10 packets received, 0% packet loss
round-trip min/avg/max = 0.5/0.6/2.1 ms
```

8.2.7 Remote Capture



Remote capture

Enable remote capture server: □

Client address:

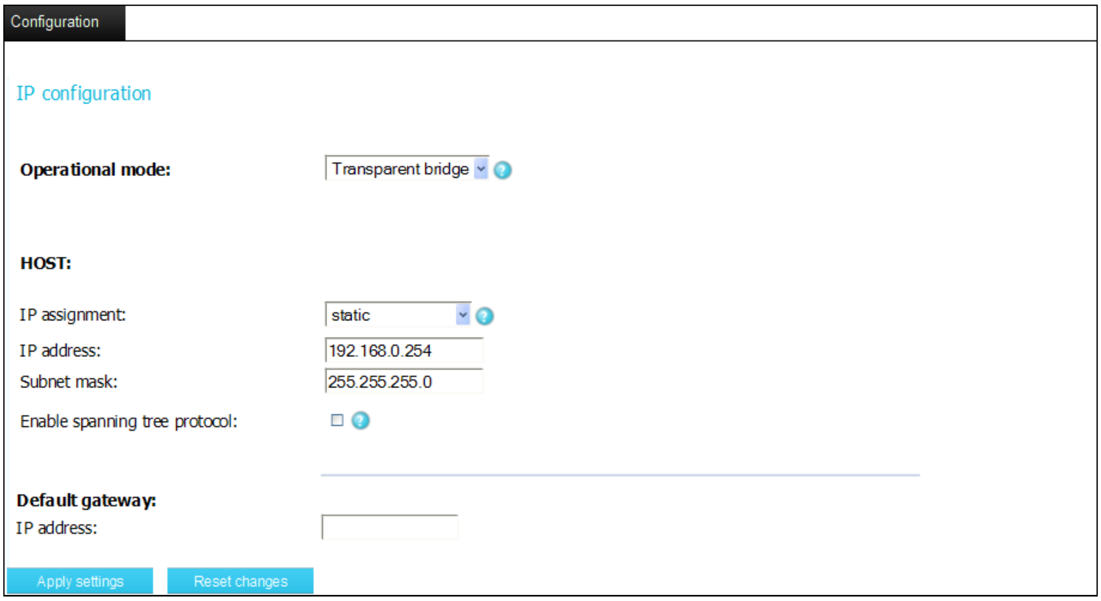
Verbose logging: □

With Remote Capture the data packets can be recorded for the individual interfaces of the access point for diagnostic purposes. Therefore it is necessary to use the tool "Wireshark" on Windows. Additionally, it is possible to set the wireless interfaces into the monitor mode to record 802.11 level packages with the tool Radiotap header.

8.3 Main menu item Configuration

8.3.1 IP configuration

The IP configuration of the Access Point.



IP configuration

Operational mode: Transparent bridge

HOST:

IP assignment: static

IP address: 192.168.0.254

Subnet mask: 255.255.255.0

Enable spanning tree protocol: □

Default gateway:

IP address:

> ***Note:***
>
> *The question mark ? to the right of the pull down menu provides you with advice and brief explanations for the menu items available for selection.*

Static:

If this option is selected, a permanently assigned IP address may be entered.

Static IP-address assignment requires that the IP address and the subnet mask is entered.

The default values are:

IP address: **192.168.0.254**

Subnet mask: **255.255.255.0**

DHCP:

The DHCP function requests an IP address from a DHCP server and assigns it automatically to the Access Point.

DHCP with fallback address:

This option is a combination of static and automatic IP-address assignment. If an error occurs during automatic address assignment of the DHCP server, or if no DHCP server is available, IP assignment automatically switches to the entered static IP address.

Activate Spanning Tree Protocol:

The spanning tree protocol is used for avoiding loops in particular in network environments with switching.

With this function activated, redundant network lines can be generated.

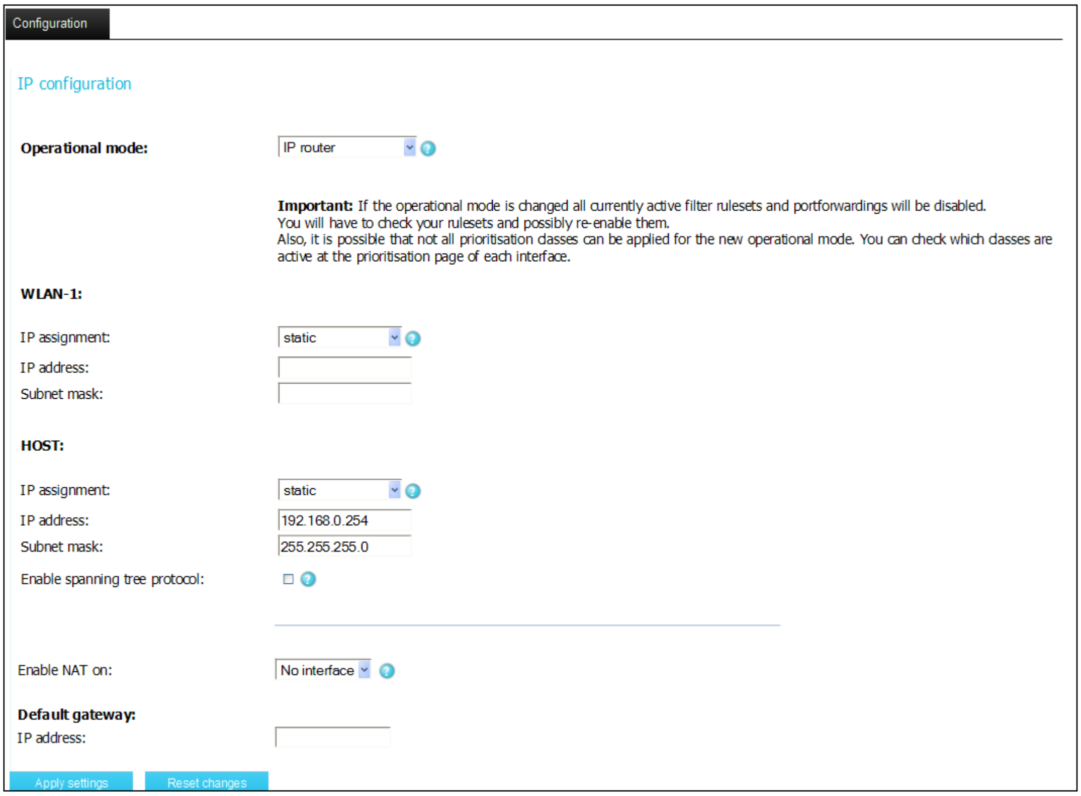
Default gateway:

In this option, you can specify the IP address of the gateway to be used.

The IP address of this default gateway is used by the device for setting up an IP configuration for an address outside of its own IP subnet (outside of 192.168.0.254 in this example). The IP address, however, must be within the range of this network. Its value will probably be overwritten by a dynamic DHCP value if DHCP was configured under IP assignment, and if the DHCP server supports this option. The default gateway might be required e.g. in order to reach an NTP time server, or in order to forward the IP address to WLAN clients in case of a DHCP setup.

IP ROUTER

The IP router option divides the networks in two separate networks between LAN-in and LAN-out interface and filters them separately.



IP configuration

Operational mode: IP router

Important: If the operational mode is changed all currently active filter rulesets and portforwardings will be disabled.
You will have to check your rulesets and possibly re-enable them.
Also, it is possible that not all prioritisation classes can be applied for the new operational mode. You can check which classes are active at the prioritisation page of each interface.

WLAN-1:

IP assignment: static
IP address:
Subnet mask:

HOST:

IP assignment: static
IP address: 192.168.0.254
Subnet mask: 255.255.255.0
Enable spanning tree protocol: □

Enable NAT on: No interface

Default gateway:
IP address:

WLAN / Host interface:

IP assignment for the LAN-in interface can be made in two different ways:

Static:

If this option is selected, a permanently assigned IP address may be entered.

Static IP-address assignment requires that the IP address and the subnet mask is entered.

The default values are:

IP address: **192.168.0.254**

Subnet mask: **255.255.255.0**

DHCP:

The DHCP function requests an IP address from a DHCP server and assigns it automatically to the firewall.

DHCP with fallback address:

This option is a combination of static and automatic IP-address assignment. If an error occurs during automatic address assignment of the DHCP server, or if no DHCP server is available, IP assignment automatically switches to the entered static IP address.

Activate Spanning Tree Protocol:

The spanning tree protocol is used for avoiding loops in particular in network environments with switching. With this function activated, redundant network lines can be generated.

Activate NAT on:

By enabling the Network Address Translation (NAT) option on the selected interface, a private IP address range is masked with a global IP address. Activating NAT is recommended with DSL connections.

Standard gateway:

In this option, you can specify the IP address of the used gateway.

Click subsequently on **Apply settings.**

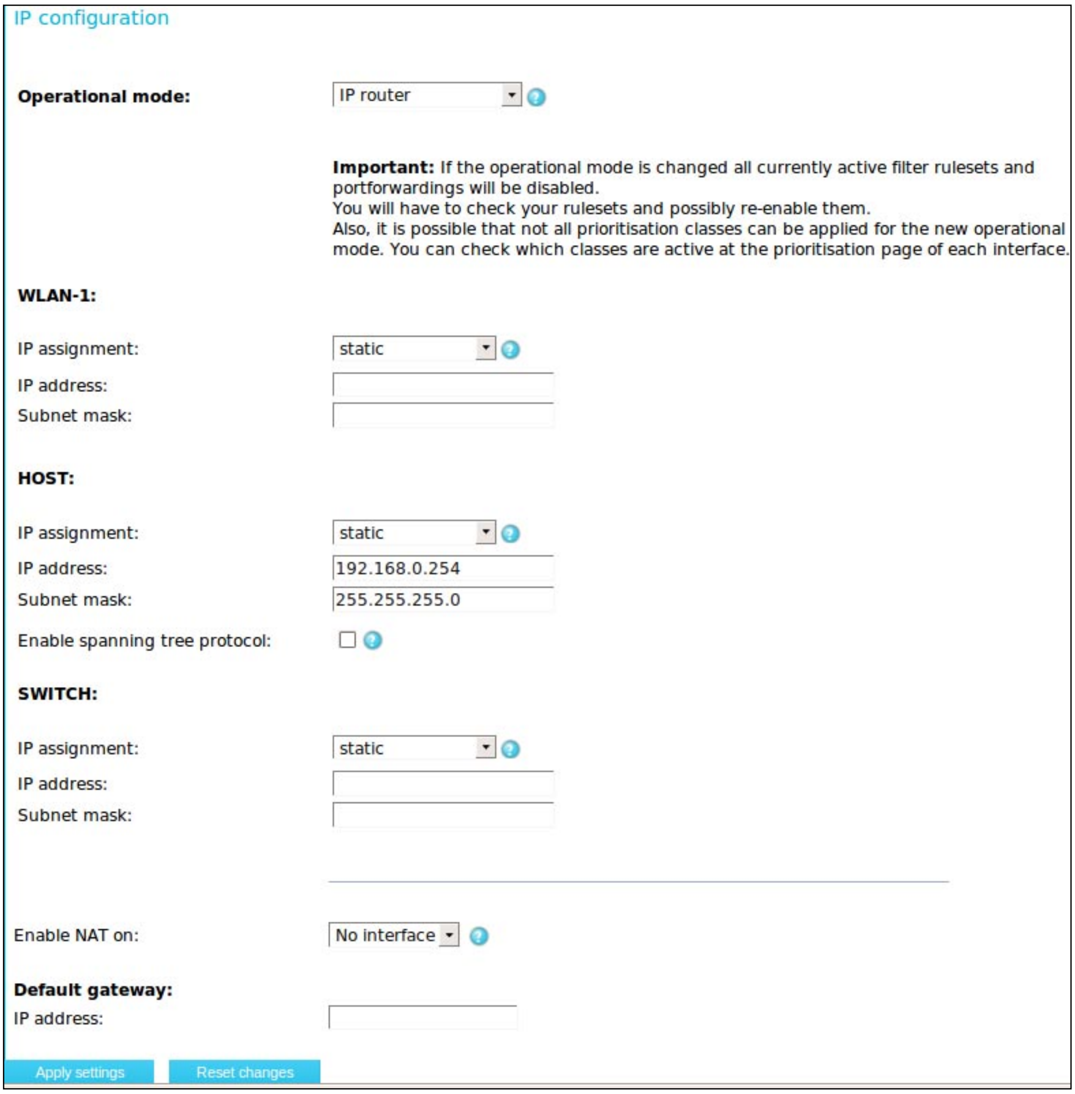
Now your changes are activated.

➔

Hinweis:

Die folgenden Konfigurationsmöglichkeiten sind nur bei entsprechender Ausstattungsvariante vorhanden.

IP CONFIGURATION (RAC15XX)



IP configuration

Operational mode: IP router

Important: If the operational mode is changed all currently active filter rulesets and portforwardings will be disabled.
You will have to check your rulesets and possibly re-enable them.
Also, it is possible that not all prioritisation classes can be applied for the new operational mode. You can check which classes are active at the prioritisation page of each interface.

WLAN-1:

IP assignment: static
IP address:
Subnet mask:

HOST:

IP assignment: static
IP address: 192.168.0.254
Subnet mask: 255.255.255.0
Enable spanning tree protocol: □

SWITCH:

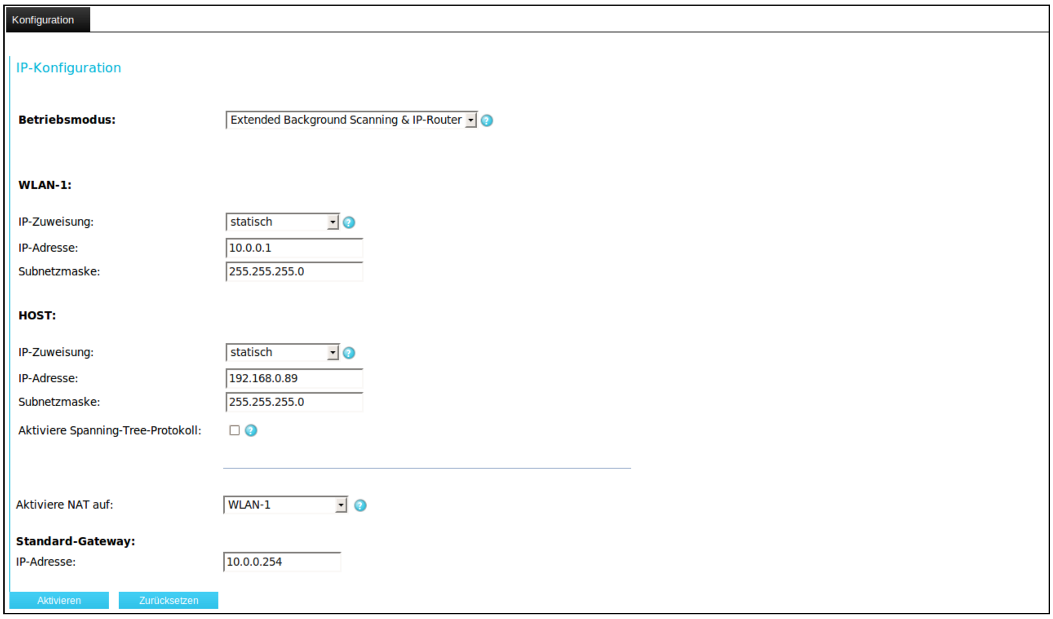
IP assignment: static
IP address:
Subnet mask:

Enable NAT on: No interface

Default gateway:
IP address:

The RAC15xx device is equipped with an integrated switch, which may be configured in the IP configuration.

EXTENDED BACKROUND SCANNING (RAC112x)



IP-Konfiguration

Betriebsmodus: Extended Background Scanning & IP-Router

WLAN-1:

IP-Zuweisung: statisch

IP-Adresse: 10.0.0.1

Subnetzmaske: 255.255.255.0

HOST:

IP-Zuweisung: statisch

IP-Adresse: 192.168.0.89

Subnetzmaske: 255.255.255.0

Aktiviere Spanning-Tree-Protokoll: □

Aktiviere NAT auf: WLAN-1

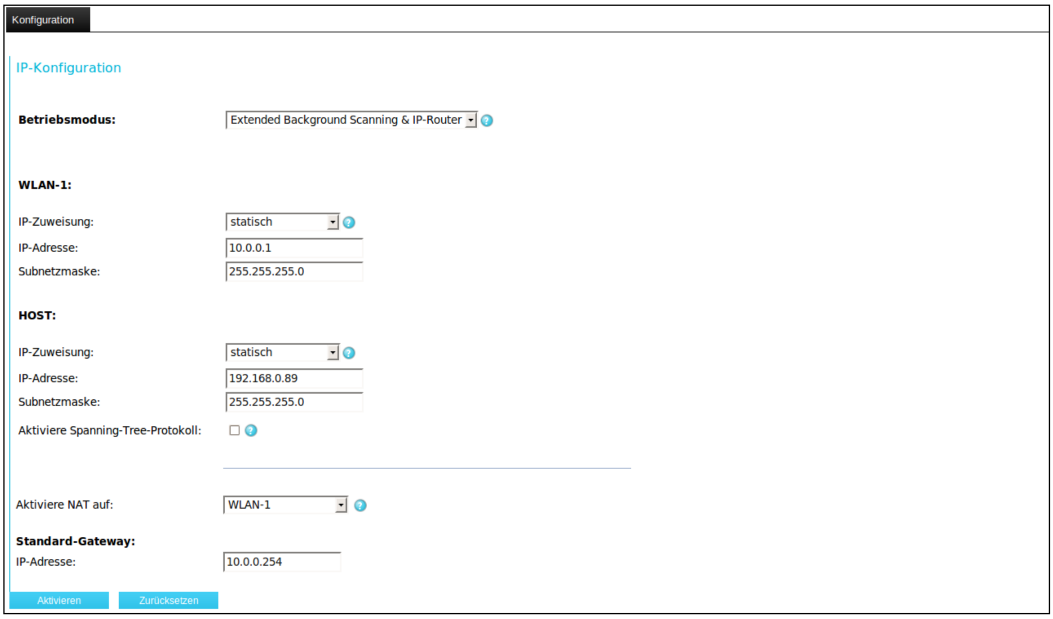
Standard-Gateway:

IP-Adresse: 10.0.0.254

The RAC112x device now supports the Extended background scanning mode. In this mode, the WLAN2 interface is exclusively used for permanently scanning for new Access Points. As soon as a better Access Point was found, the WLAN1 interface books in on the new AP. All parameters for WLAN2 are disabled in this mode.

This mode is specifically suited for fast roaming in connection with Access Points of other manufacturers. In particular, the Multi client bridge mode can be combined with the Extended background scanning mode.

EXTENDED BACKROUND SCANNING & IP-ROUTER (RAC112x)



Betriebsmodus: Extended Background Scanning & IP-Router

WLAN-1:

IP-Zuweisung: statisch
IP-Adresse: 10.0.0.1
Subnetzmaske: 255.255.255.0

HOST:

IP-Zuweisung: statisch
IP-Adresse: 192.168.0.89
Subnetzmaske: 255.255.255.0
Aktiviere Spanning-Tree-Protokoll: □

Aktiviere NAT auf: WLAN-1

Standard-Gateway:
IP-Adresse: 10.0.0.254

In this mode, WLAN-1 and HOST can be provided with their own IP addresses. The WLAN-2 interface is automatically used as Background Scanning interface.

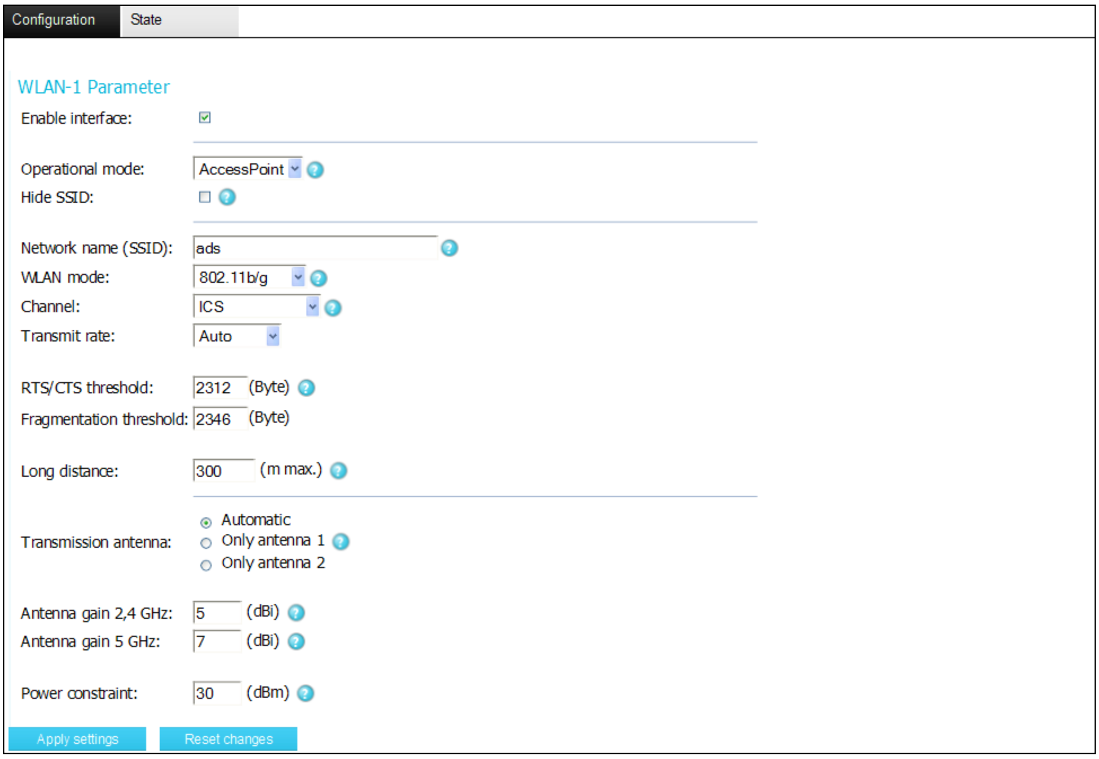
Note:
The operation mode is explicitly for WHOST infrastructures with Access Points which are not from ads-tec, and in particular for setups with Switched WLAN or WLAN Controller.

8.3.2 WLAN-1 Parameter

Using this menu, the Access Point interfaces can be set up. All interfaces have their own setup options, which have an impact on how the interface works. Additionally, unused interfaces may be disabled.

> ***Note:***
> *Depending on the equipment version of the device, 2 WLAN interfaces might be available.*

WLAN1 (Access Point) 2.4GHz-802.11b/g:



WLAN-1 Parameter

Enable interface: ☑

Operational mode: AccessPoint

Hide SSID: □

Network name (SSID): ads

WLAN mode: 802.11b/g

Channel: ICS

Transmit rate: Auto

RTS/CTS threshold: 2312 (Byte)

Fragmentation threshold: 2346 (Byte)

Long distance: 300 (m max.)

Transmission antenna: ● Automatic ○ Only antenna 1 ○ Only antenna 2

Antenna gain 2,4 GHz: 5 (dBi)

Antenna gain 5 GHz: 7 (dBi)

Power constraint: 30 (dBm)

The checkbox next to Enable interface must be ticked so that changes and settings can be made with respect to the interface.

Operational mode: Switching / Selection: Access Point / Client (this option is not available on the RAC111x or RAC151x model.

Hide SSID: The SSID (network name) will not be displayed with this function enabled.

Network name (SSID): Name of the network. Default setting: **ads.** The SSID may contain up to 32 characters.

> ***Note:***
> *Valid characters are: a-z, A-Z, 0-9 and the special characters: . _ - ? $ @ ! { } [ ] ( ) + # ; , < > | : * ~ % $ & / =*

WLAN mode: Selection of a specific WLAN mode

Channel: Offers the opportunity of either selecting a specific channel or the automatic channel search function.

Note:

*If the **Intelligent Channel Selection (ICS)** function is active, all ads-tec Access Points in a local Ethernet segment are interlocked and optimize their channel selection on the basis of different parameters. Here both the signal propagation ratios between the devices are recorded and measured and other interfering Access Points outside the network are taken into consideration. An ads-tec Access Point starts ICS measurement during the booting process if the option is activated for the first time or the **Remeasure Timer** has expired (visible by alternately flashing (red/green) LEDs on HOST port). The measuring phase takes ~100 seconds. During this time, WLAN Clients cannot login at the AP. If 5Ghz are configured with the DFS, the time up to readiness is extended to ~160 seconds.*

Transmit rate: Allows manual or automatic setup of the Mbit rate.

CTS/RTS threshold: A signal is transmitted to the Access Point if a packet to be transmitted has a size which exceeds the value setup in this item. The Access Point then reserves the channel for this packet.

Fragmentation threshold: If a packet exceeds the value set up in this item, the packet will be fragmented and divided into smaller packet units.

Note:

This fragmentation threshold cannot be used with the WPA encryption standard turned on.

Longdistance:

If a large distance must be overcome between 2 devices the timeout for specifying the distance may be increased here. The longer timeout setting causes the Access Point to wait longer for proper reception of a response from the remote terminal.

Transmission antenna:

By selecting the transmission antenna you can decide if the transmission antenna should be selected automatically or set up manually.

Antenna gain: The antenna gain can be used in order to gain higher transmission power. Furthermore, it is limited by valid regulations of the respective country.

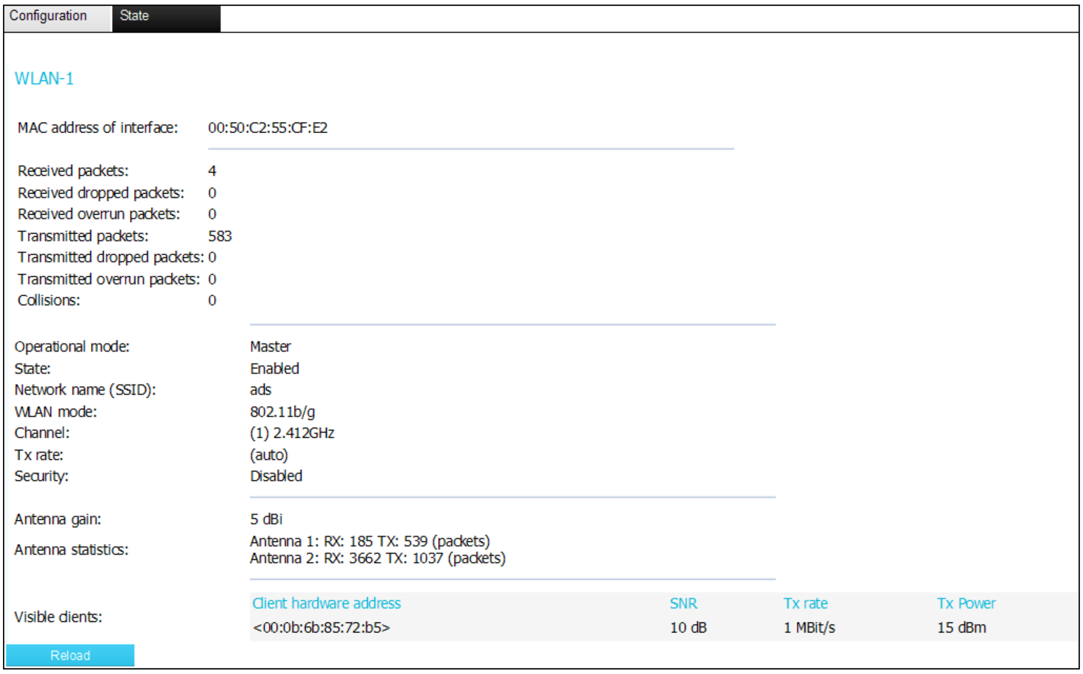
Example: An antenna with the value of 10dbi and a cable with the value of 3 db are used. The value for the antenna amplification in this case amounts to 7dbi.

Power constraint:

The power constraint limits the Access Point power to the indicated value. The value entered here is transmitted to all clients having access to the Access Point.

STATE

View: Access Point



WLAN-1

MAC address of interface: 00:50:C2:55:CF:E2

Received packets: 4
Received dropped packets: 0
Received overrun packets: 0
Transmitted packets: 583
Transmitted dropped packets: 0
Transmitted overrun packets: 0
Collisions: 0

Operational mode: Master
State: Enabled
Network name (SSID): ads
WLAN mode: 802.11b/g
Channel: (1) 2.412GHz
Tx rate: (auto)
Security: Disabled

Antenna gain: 5 dBi
Antenna statistics: Antenna 1: RX: 185 TX: 539 (packets)
Antenna 2: RX: 3662 TX: 1037 (packets)

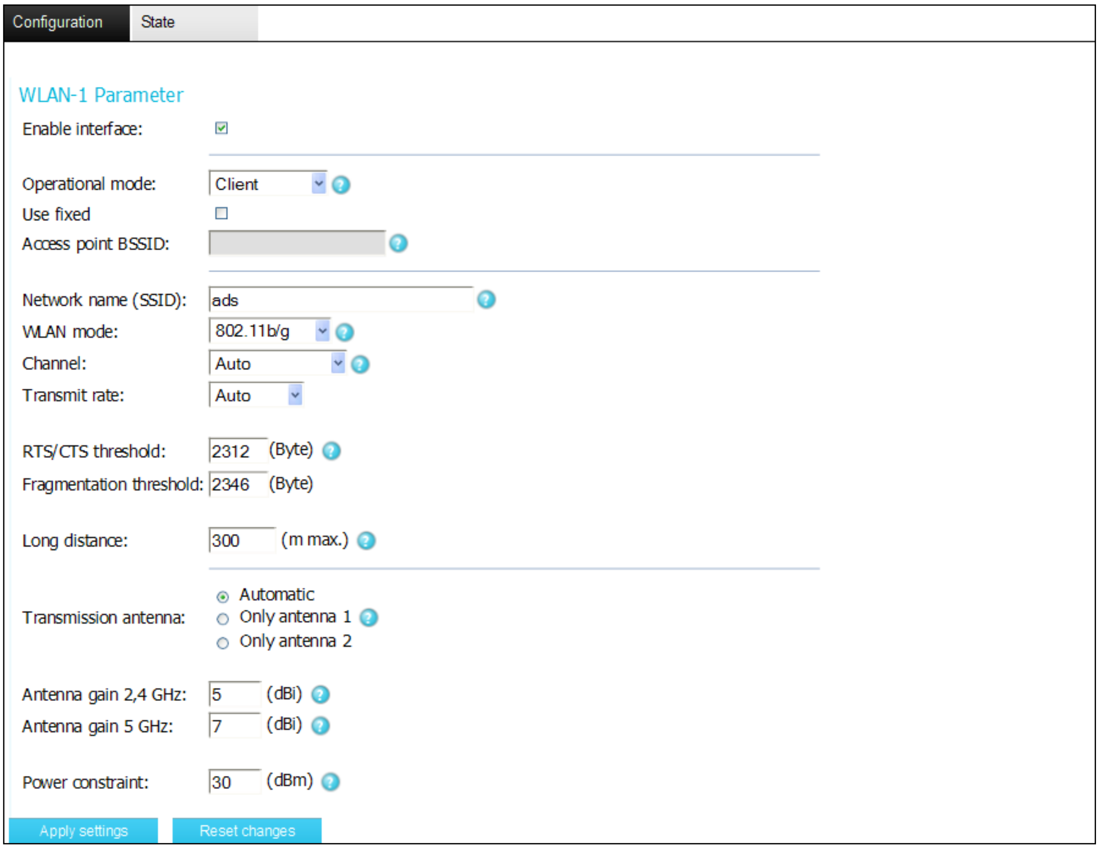
Visible clients:

Client hardware address	SNR	Tx rate	Tx Power
<00:0b:6b:85:72:b5>	10 dB	1 MBit/s	15 dBm

The state display of the WLAN-1 interface shows data traffic characteristics. The display can be updated by using the **Reload** button.

WLAN-1 (Access Client) 2.4 GHz – 802.11b/g:

The client option is only distinguished in two points: the "Hide SSID" option is missing and there is one new option, the "Use fixed Access Point BSSID":



WLAN-1 Parameter

Enable interface: ☑

Operational mode: Client

Use fixed Access point BSSID: □

Network name (SSID): ads

WLAN mode: 802.11b/g

Channel: Auto

Transmit rate: Auto

RTS/CTS threshold: 2312 (Byte)

Fragmentation threshold: 2346 (Byte)

Long distance: 300 (m max.)

Transmission antenna:
● Automatic
○ Only antenna 1
○ Only antenna 2

Antenna gain 2,4 GHz: 5 (dBi)

Antenna gain 5 GHz: 7 (dBi)

Power constraint: 30 (dBm)

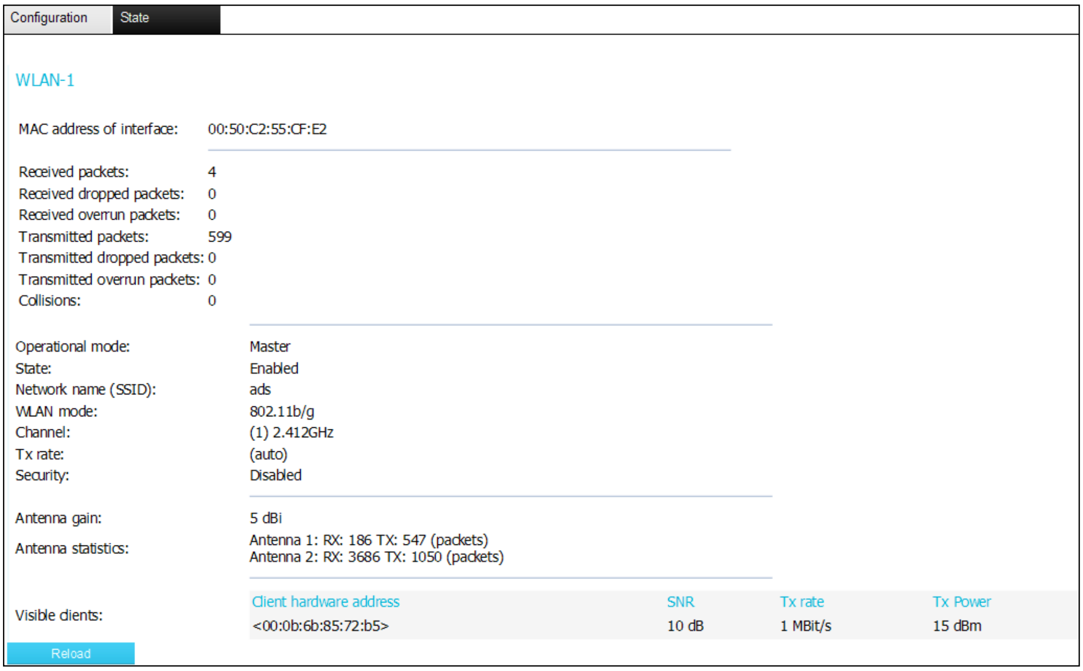
Use fixed Access Point BSSID:

If this option is enabled, you can enter the MAC address of an Access Point. This option is helpful with Access Points sharing the same SSID, because the respective device can still individually be addressed.

Confirm this action subsequently with **Apply settings.**

STATE

Access client view:



WLAN-1

MAC address of interface: 00:50:C2:55:CF:E2

Received packets:	4
Received dropped packets:	0
Received overrun packets:	0
Transmitted packets:	599
Transmitted dropped packets:	0
Transmitted overrun packets:	0
Collisions:	0

Operational mode:	Master
State:	Enabled
Network name (SSID):	ads
WLAN mode:	802.11b/g
Channel:	(1) 2.412GHz
Tx rate:	(auto)
Security:	Disabled
Antenna gain:	5 dBi
Antenna statistics:	Antenna 1: RX: 186 TX: 547 (packets) Antenna 2: RX: 3686 TX: 1050 (packets)

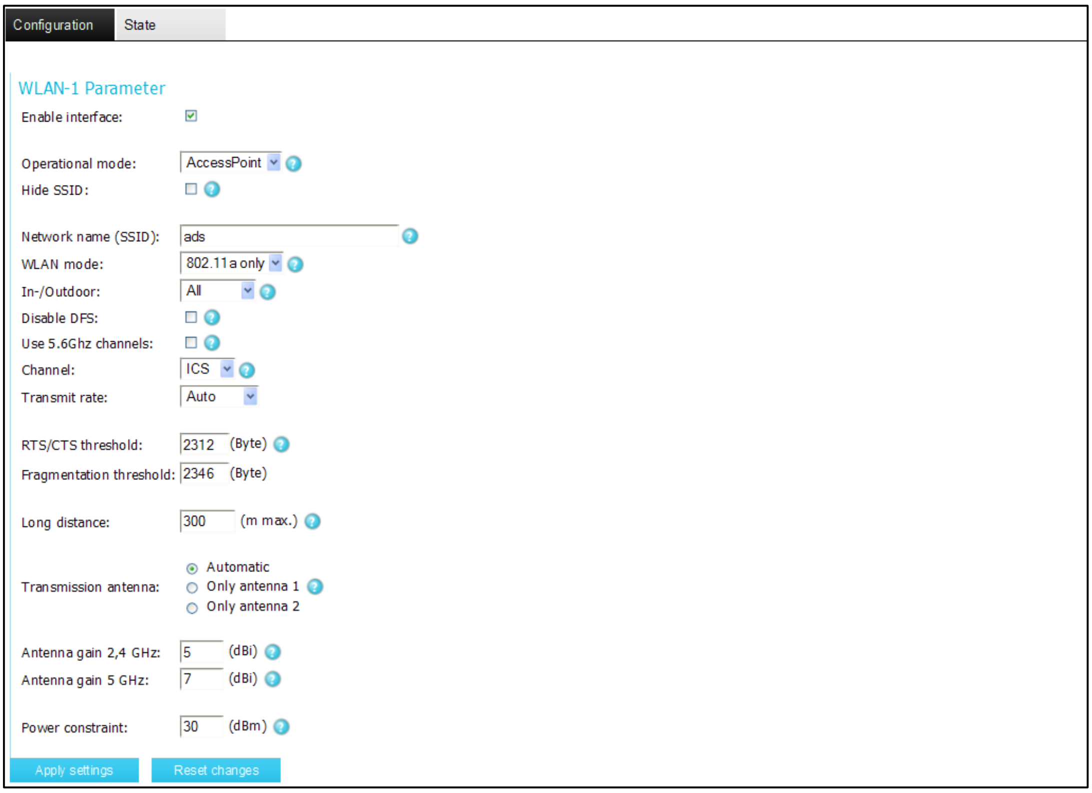
Visible clients:

Client hardware address	SNR	Tx rate	Tx Power
<00:0b:6b:85:72:b5>	10 dB	1 MBit/s	15 dBm

The state display of the WLAN-1 interface shows data traffic characteristics. The display can be updated by using the **Reload** button.

WLAN1 (Access Point & Access Client) 5 GHz – 802.11a (ETSI):

If the WLAN 802.11a mode or in case of the client, the 802.11a/b/g mode is configured, the following options change:



WLAN-1 Parameter

Enable interface: ☑

Operational mode: AccessPoint

Hide SSID: □

Network name (SSID): ads

WLAN mode: 802.11a only

In-/Outdoor: All

Disable DFS: □

Use 5.6Ghz channels: □

Channel: ICS

Transmit rate: Auto

RTS/CTS threshold: 2312 (Byte)

Fragmentation threshold: 2346 (Byte)

Long distance: 300 (m max.)

Transmission antenna: ● Automatic ○ Only antenna 1 ○ Only antenna 2

Antenna gain 2,4 GHz: 5 (dBi)

Antenna gain 5 GHz: 7 (dBi)

Power constraint: 30 (dBm)

Hinweis:

The Option „Outdoor" is just available in Access Point Mode. The Option „Deactivate DFS" is available in both Modes.

Outdoor:

Must be enabled if the Access Point is part of a radio connection in the outdoor area. Certain channels of the 5GHz band may not be used outdoors, and will be excluded by this option. This option is of no importance for Access Clients.

Disable DFS:

You may disable DFS if the Access Point is NOT used outdoors. You may also manually set up channels 36, 40, 44 and 48 as fixed channels, in this case. Additionally, the permissible maximum output power is reduced. In client mode, in contrast to that, DFS may also be disabled for outdoor use.

Use 5.6 Ghz Channels:

The channels 120.124 and 128 will be activated. When the DFS function is enabled, a response time (Channel Availability Check Time) of 10 minutes must be observed.

Note:

In client mode, the DFS function is disabled by default. Caused by the radar detection during data transmission, strong interferences might occur in particular at the client, which have to be evaluated as Potential Radar Pulses. A very high CPU load and faulty, frequently occurring radar detection cycles are results of that. For this reason, DFS should be enabled in client mode only if the client output power exceeds 23dB, and if 30dBm are required for establishing a stable data connection. If another 5GHz device is located near the device in question, this might also cause significant disturbances to the client mode, if DFS is activated there as well.

WLAN1 (Access Point & Access Client) 2.4 GHz – 802.11a (FCC):

The FCC setup version for interfaces has the following additional setup options:

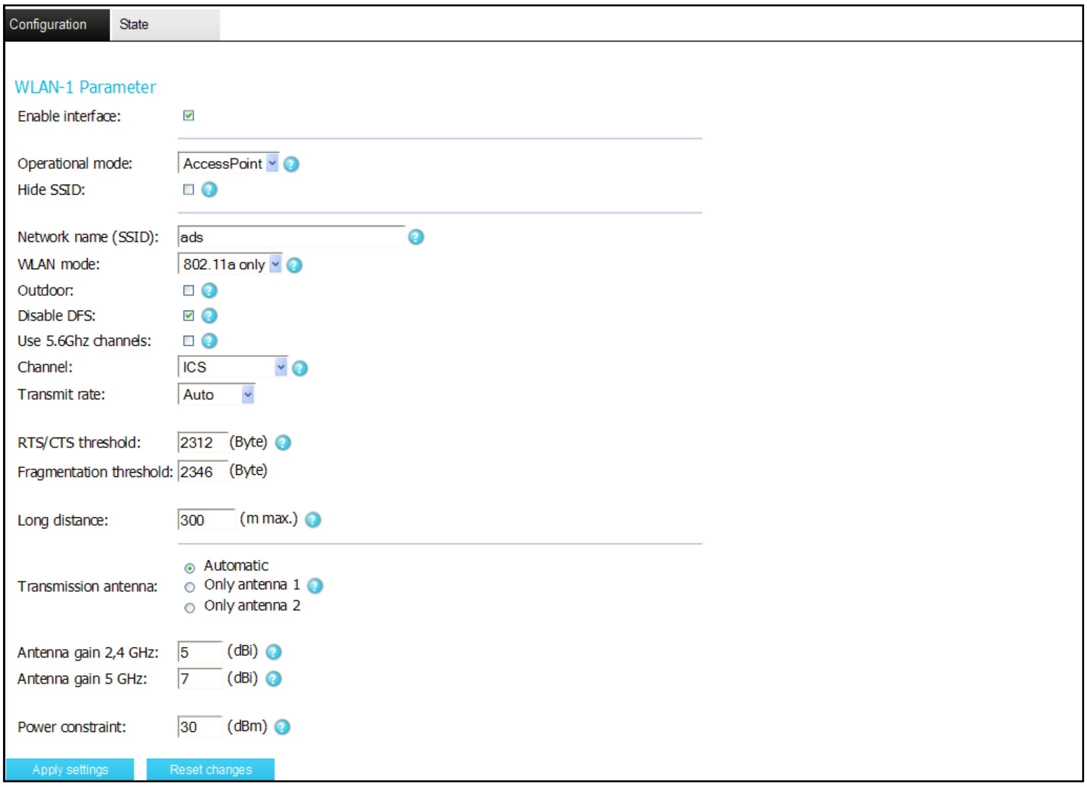
Indoor/Outdoor:

Must be enabled if the Access Point is part of a radio connection in the outdoor area. Certain channels of the 5GHz band may not be used outdoors, and will be excluded by this option. When used indoors the option indoor can be used. This option is of no importance for Access Clients.

Point-to-point radio antenna: If you want to connect a point-to-point radio antenna, you must activate this checkbox.

Note:

DFS and TPC are disabled in this case. The only difference to the A version is, that version 802.11b/g (FCC) has the point-to-point antenna setup as an additional option.



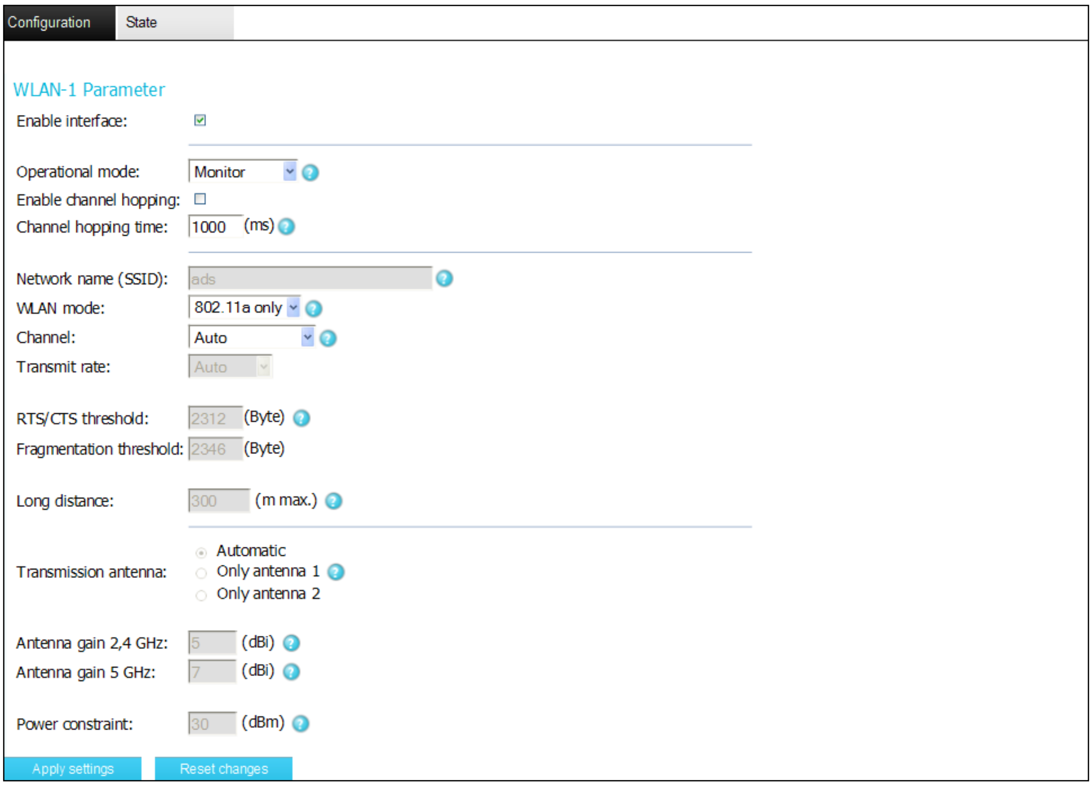
WLAN-1 Parameter

Enable interface:	☑
Operational mode:	AccessPoint
Hide SSID:	□
Network name (SSID):	ads
WLAN mode:	802.11a only
Outdoor:	□
Disable DFS:	☑
Use 5.6Ghz channels:	□
Channel:	ICS
Transmit rate:	Auto
RTS/CTS threshold:	2312 (Byte)
Fragmentation threshold:	2346 (Byte)
Long distance:	300 (m max.)
Transmission antenna:	● Automatic ○ Only antenna 1 ○ Only antenna 2
Antenna gain 2,4 GHz:	5 (dBi)
Antenna gain 5 GHz:	7 (dBi)
Power constraint:	30 (dBm)

MONITOR

In monitor mode data packets can be recorded an transferred to a PC.

> ***Note:***
>
> *This function will only work in combination with Remote Capture..*



WLAN-1 Parameter

Enable interface: ☑

Operational mode: Monitor

Enable channel hopping: □

Channel hopping time: 1000 (ms)

Network name (SSID): ads

WLAN mode: 802.11a only

Channel: Auto

Transmit rate: Auto

RTS/CTS threshold: 2312 (Byte)

Fragmentation threshold: 2346 (Byte)

Long distance: 300 (m max.)

Transmission antenna: ● Automatic ○ Only antenna 1 ○ Only antenna 2

Antenna gain 2,4 GHz: 5 (dBi)

Antenna gain 5 GHz: 7 (dBi)

Power constraint: 30 (dBm)

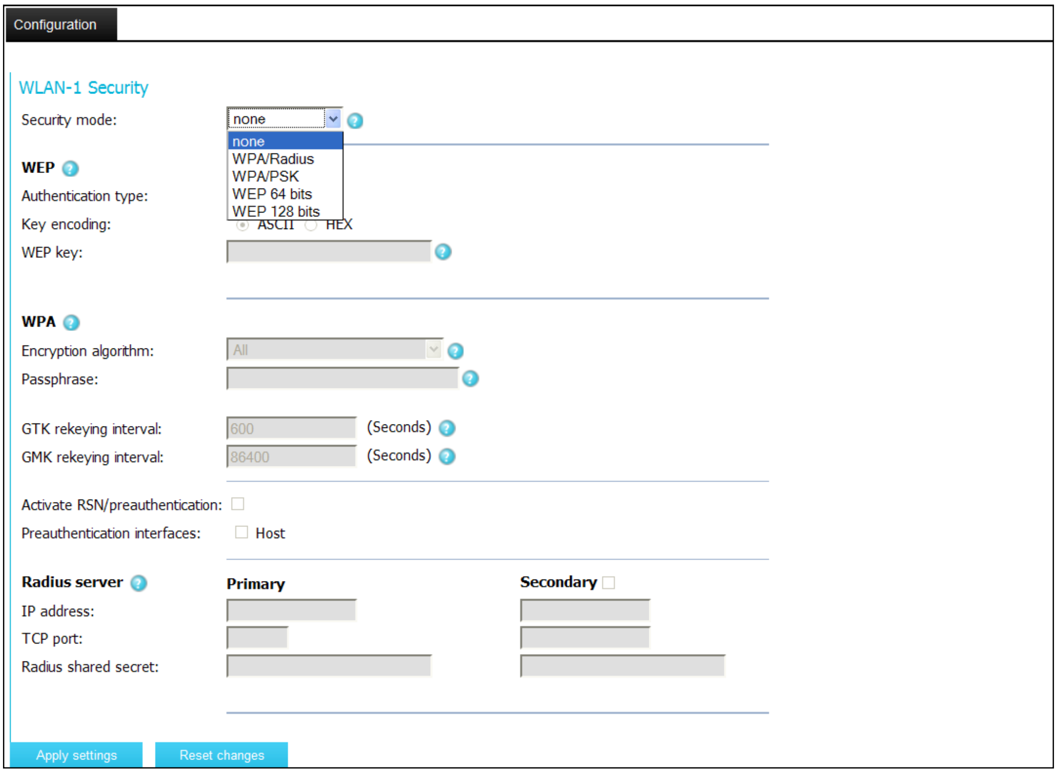
<u>Enable channel hopping:</u>

If the function is enabled all available channels will be passed and records packages for the set time.

8.4 WLAN-1 SECURITY

WLAN 1 / 2

The WLAN Security settings allow configuring the corresponding security standards for the WLAN network. The following modes are available for selection:



WLAN-1 Security

Security mode: none

WEP

Authentication type:

Key encoding: ● ASCII ○ HEX

WEP key:

WPA

Encryption algorithm: All

Passphrase:

GTK rekeying interval: 600 (Seconds)

GMK rekeying interval: 86400 (Seconds)

Activate RSN/preauthentication: □

Preauthentication interfaces: □ Host

Radius server **Primary** **Secondary** □

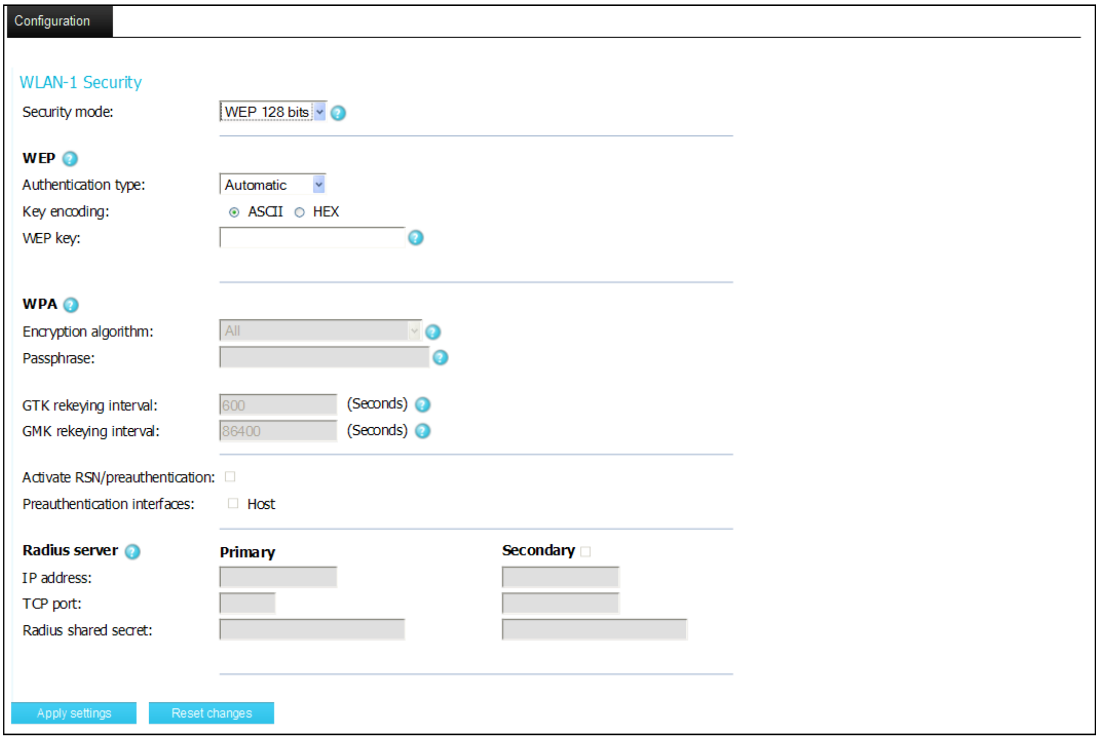
IP address:

TCP port:

Radius shared secret:

WEP 64 BITS / WEP 128 BITS

A preshared key, which controls access to the WLAN network, is used in the WPA settings with the WEP 64 bits / 128 bits mode. The difference is that this key cannot be changed in WEP mode, but remains a static key.



WLAN-1 Security

Security mode: WEP 128 bits

WEP

Authentication type: Automatic

Key encoding: ● ASCII ○ HEX

WEP key:

WPA

Encryption algorithm: All

Passphrase:

GTK rekeying interval: 600 (Seconds)

GMK rekeying interval: 86400 (Seconds)

Activate RSN/preauthentication: □

Preauthentication interfaces: □ Host

Radius server	**Primary**	**Secondary** □
IP address:		
TCP port:		
Radius shared secret:		

AUTHENTICATION TYPE:

Automatic:

The Automatic mode automatically selects the authentication type.

Open System:

The **Open System** authentication type is the default authentication setting.

Shared Key:

The Shared Key authentication type is using an extended handshake mechanism for logging in, which however, does not provide additional security.

Key encoding:

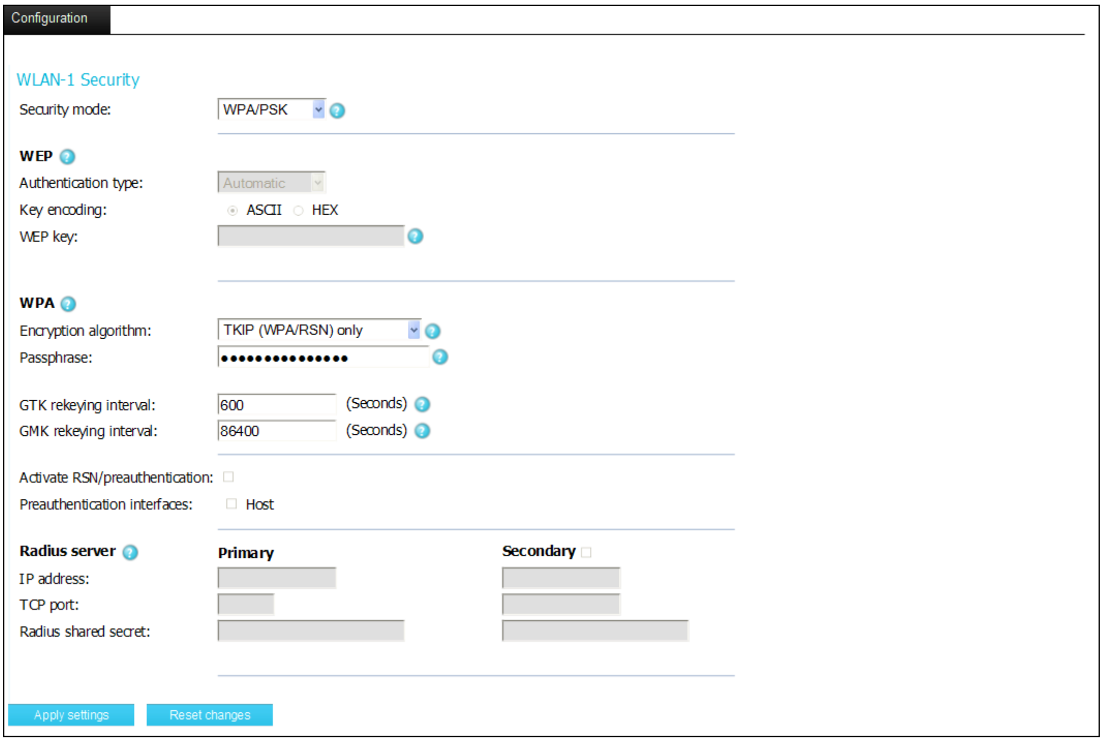
ASCII or HEX may be used as key encoding types. ASCII is a 7-bit, and HEX is a 16-bit encoding system.

WEP key:

The WEP key is restricted to 5 characters if ASCII is selected. HEX allows entering a 10-digit WEP key. No words, but combinations of letters and numbers should be used when choosing the key.

WPA/PSK

A key in combination with a specific encryption method is used in the WKA/PSK mode. The key (preshared key) must have between 8 and 63 characters. It is recommended to choose not words but combinations of letters and numbers in order to ensure an optimum in security.



WLAN-1 Security

Security mode: WPA/PSK

WEP

Authentication type: Automatic

Key encoding: ● ASCII ○ HEX

WEP key:

WPA

Encryption algorithm: TKIP (WPA/RSN) only

Passphrase: •••••••••••••••

GTK rekeying interval: 600 (Seconds)

GMK rekeying interval: 86400 (Seconds)

Activate RSN/preauthentication: □

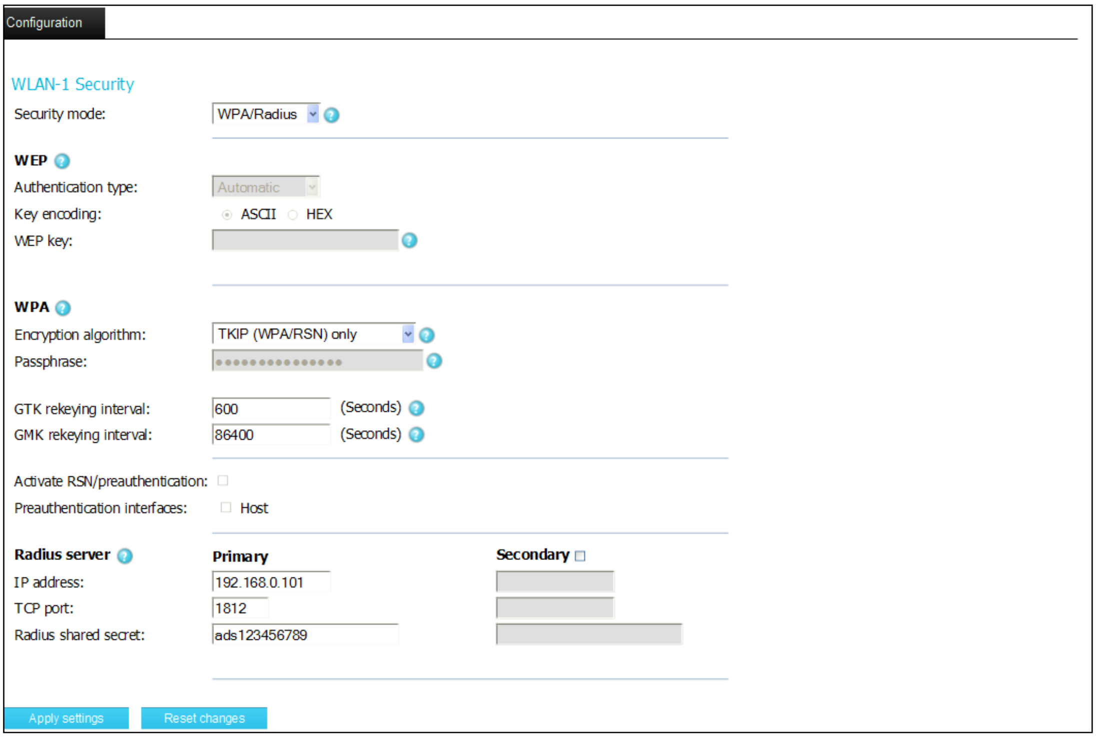
Preauthentication interfaces: □ Host

Radius server	Primary	Secondary □
IP address:		
TCP port:		
Radius shared secret:		

Encryption algorithm:

It is possible to either use all encryption algorithms or a specific encryption algorithm. You have to consider here, that the WPA 2 standard must be supported by all devices in order to ensure proper function.

WPA RADIUS SERVER



WLAN-1 Security

Security mode: WPA/Radius

WEP

Authentication type: Automatic

Key encoding: ● ASCII ○ HEX

WEP key:

WPA

Encryption algorithm: TKIP (WPA/RSN) only

Passphrase: •••••••••••••••

GTK rekeying interval: 600 (Seconds)

GMK rekeying interval: 86400 (Seconds)

Activate RSN/preauthentication: □

Preauthentication interfaces: □ Host

Radius server	**Primary**	**Secondary** □
IP address:	192.168.0.101	
TCP port:	1812	
Radius shared secret:	ads123456789	

The Access Point is capable of using an existing Radius server for account authentication. For this option, the Radius server IP-address must be entered in the IP address box.

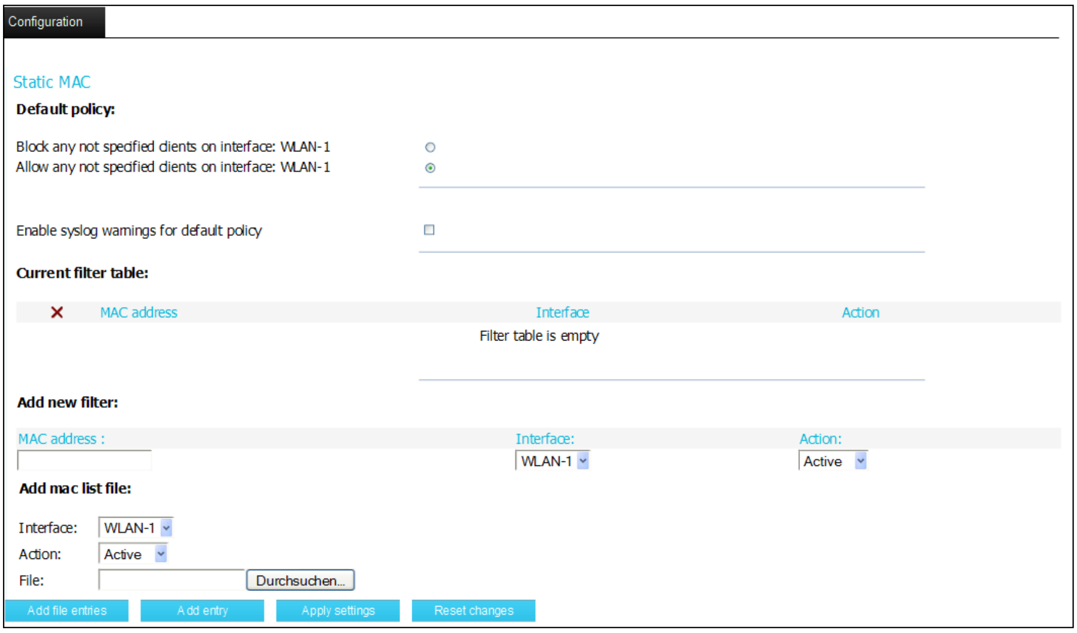
The TCP port, on which the Radius server is operated, must be entered under TCP port, too. Usually, the radius server runs on TCP port 1812.

Using the Radius shared secret, the Access Point will be identified and authenticated at the radius server.

If two radius servers are used, another configuration may be entered under Secondary, as an alternative. This specification only comes into effect if the Primary radius server previously could not be reached. The Access Point will then try to establish a connection to the Secondary radius server. Confirm this action with Apply settings.

8.5 STATIC MAC ADDRESS

The static MAC filter can be used in order to provide an interface, which has been configured as an Access Point, with an access control capability. In this case, the MAC address of a WLAN client is checked against the access list configured, and access will be granted according to that. If access for a client is barred, the client will be rejected when attempting to log in with the 802.11 protocol. This configuration, however, does not provide very high security levels because the MAC address can easily be forged. In case of WPA encryption, this method is not useful because WPA itself already offers sufficient security. A MAC filter as an additional protective method would only make sense in connection with WEP encryption. If an interface is not included in the Access Point mode, the filter table cannot be used. The text "No wlan interface in AP mode, filter is inactive" will appear. This menu item does not exist with RAC111x and RAC151x.



Static MAC

Default policy:

Block any not specified clients on interface: WLAN-1 ○
Allow any not specified clients on interface: WLAN-1 ●

Enable syslog warnings for default policy □

Current filter table:

✕	MAC address	Interface	Action
	Filter table is empty		

Add new filter:

MAC address :	Interface:	Action:
	WLAN-1	Active

Add mac list file:

Interface: WLAN-1
Action: Active
File:

Default policy:

The default policy defines what should be done with a MAC address in the filter table. A client can explicitly be locked out (Blacklist) or permitted (Whitelist). The last option is the setting used in most cases.

Syslog:

If this option is set, a message will be generated in the Eventlog if a client is rejected, because the client is explicitly locked out or not permitted.

Add new filter:

The MAC address of the client must be specified e.g. in the 00:50:C2:48:A1:BB format, and the interfaces on which this entry should be valid, must be specified, in order to create a new filter table entry (WLAN-1, WLAN-2, *). The options "Active" or "Inactive" can be selected under "Action" in order to temporarily deactivate an entry or to activate this entry not immediately. Subsequently you have to click on "**Add entry**".

Add mac list file:

If multiple MAC addresses should be configured at once, it can be useful to use a text file including a list of all MAC addresses. Such a file will contain one MAC address per line, e.g.
00:50:C2:48:A1:00
00:50:C2:48:A1:02
00:50:C2:48:A1:01

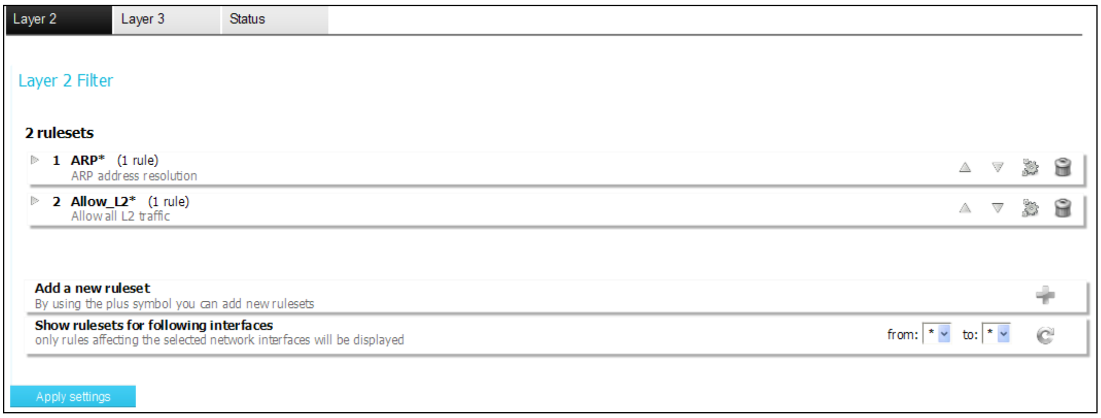
Additionally, you'd have to select if the MAC addresses loaded in this way are supposed to be "**Active**" or "**Inactive**", and on which interface they should be valid. This list will be added to the existing entries. A maximum of 500 entries may be stored.

Note:
If this list is very long, processing might take a long time; you'd have to expect approximately 1 second per entry. This period will then also be required for booting when the settings are loaded.

8.6 Filter wizard

Note:
The Filter wizard may also be started using the start page of the Web interface.

The filter wizard supports you in creating rules in such way that a step-by-step user interface automatically creates prompts for the most frequently used configuration parameters of rules.



Layer 2 Filter

2 rulesets

▷ **1 ARP*** (1 rule)
ARP address resolution

▷ **2 Allow_L2*** (1 rule)
Allow all L2 traffic

Add a new ruleset
By using the plus symbol you can add new rulesets

Show rulesets for following interfaces
only rules affecting the selected network interfaces will be displayed

from: * to: *

Note:
Rules will be processed in the order of the list. If a rule is true, then processing for this packet will be finished.

→A rule set is only considered for a packet if the „in/outbound" interface setting matches the packet.

→When running through a rule set, the rules contained in the set are run through from top to bottom.

→Once a rule matches exactly with the packet in a running rule set, the related action will be executed and no other rule be checked.

Each rule set may contain up to 10 rules whereas all rules of a rule set must have the same configuration with regard to the respective inbound or outbound interface. The active Layer 2 rule sets are displayed on the main page of the packet filter.

The rule sets displayed on the basis of inbound and outbound interfaces can be restricted by means of a filter function at the end of the page. This has no impact on the functionality of the rules, i.e. non-displayed rules are nevertheless active.

New rule sets can be added by means of the toolbar above the filter function for inbound and outbound interfaces. By clicking on the plus symbol, a dialogue will appear leading the user step by step through the setting options of the various log levels.

In the operation mode of Extended IP Router with selected Layer 2 level, only Open VPN interfaces can be filtered. The Layer 3 level allows filtration of all interfaces with an IP address in any direction.

Only those rule sets appear in the list for which the inbound and outbound interfaces and the communication direction match.

Note:
*After defining the rules, the button **Apply changes** in the web interface must be activated for testing this function.*

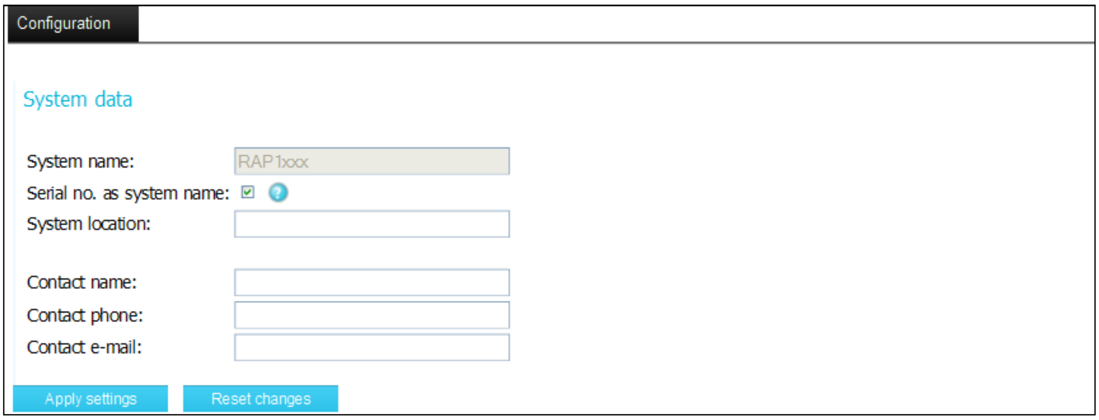
8.7 BASIC SETTINGS

SYSTEM DATA

Important data such as the location and service addresses may be stored by using the System data user box. This information is used for unambiguous identification of the device at its location and of the corresponding contact data, which you can view here in a service case.

Serial no. as system name:

This option is activated by default and displays the systemname and the serial number of the device.



System name:	RAP1xxx
Serial no. as system name:	☑
System location:	
Contact name:	
Contact phone:	
Contact e-mail:	

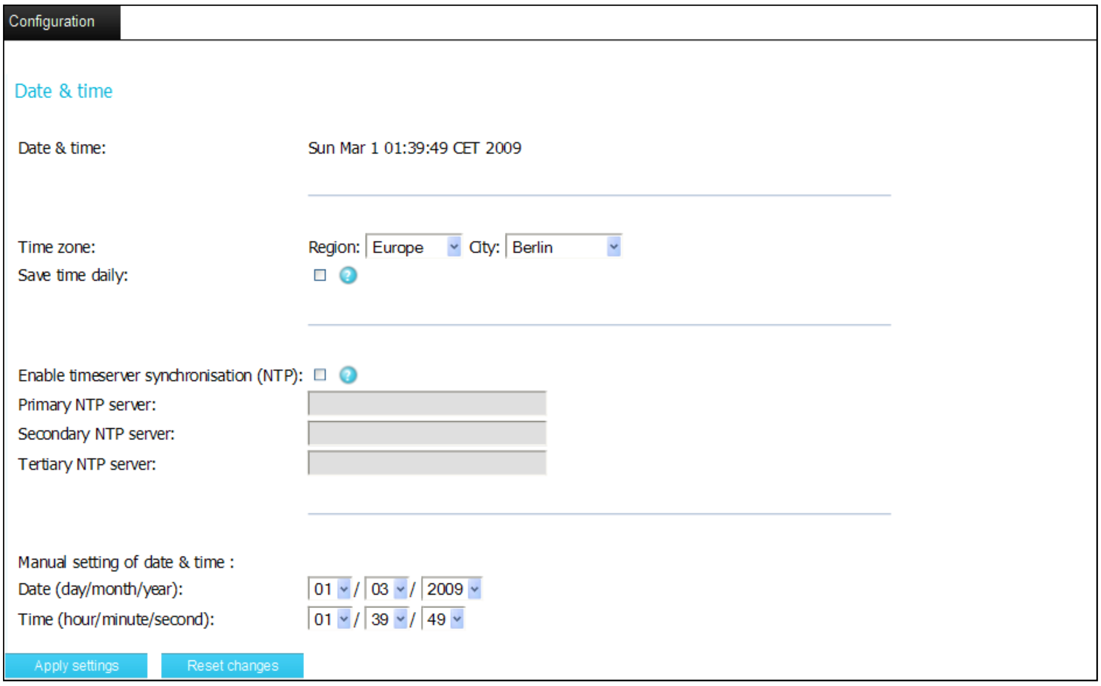
For confirming the settings you made, please click on **Apply settings.**

Date & time

Date and time can be configured via **Date & Time.**

The device is not equipped with a Real Time Clock. Therefore, settings are reset to the last saved values after a power failure.

The time is automatically synchronized by activation and input of the IP address of the NTP server.



Date & time

Date & time: Sun Mar 1 01:39:49 CET 2009

Time zone: Region: Europe City: Berlin

Save time daily: □

Enable timeserver synchronisation (NTP): □

Primary NTP server:

Secondary NTP server:

Tertiary NTP server:

Manual setting of date & time :

Date (day/month/year): 01 / 03 / 2009

Time (hour/minute/second): 01 / 39 / 49

Time zone:

The correct time zone is set in the Drop Down menu.

Daily saving of current time:

If the option is ticked, the current system time will be saved.

Activate time synchronization with timer server (NTP):

The function allows for synchronization of date and time by means of three different NTP servers. Once an NTP server responds successfully, this one will be used.

For this purpose activate the checkbox next to the option and enter the IP address of the NTP server.

Manual setting of date & time:

Here the current date and time can be set manually.

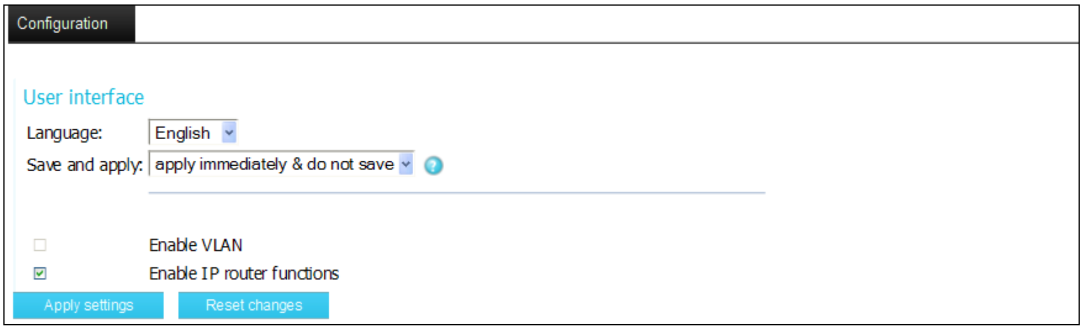
For taking over changes, click on **Activate.**

➔ ***Hinweis:***

Date and time settings are important for the creation of certificates, the evaluation of event log entries and for time-based rules. Without activated NTP server, the current time gets lost after a power failure, i.e. it has to be reset manually

USER INTERFACE

In the "**User interface**" menu, you can set the web interface language to German or English.



User interface

Language: English

Save and apply: apply immediately & do not save

□ Enable VLAN

☑ Enable IP router functions

In the pull down menu, you can choose from the options "**Apply immediately & do not save**" or "**Save only & do not apply**".

The "**Apply immediately & do not save**" function shows an "Apply settings" button on all pages in the Access Point menu, by means of which the changes made may immediately be applied. Settings must be saved by clicking on the flashing floppy disk icon now, in order to retain this new configuration even after restarting.
The "**Save only & do not apply**" function shows a "Save settings" button on all pages in the Access Point menu. Changed settings will not be applied, but immediately saved instead.

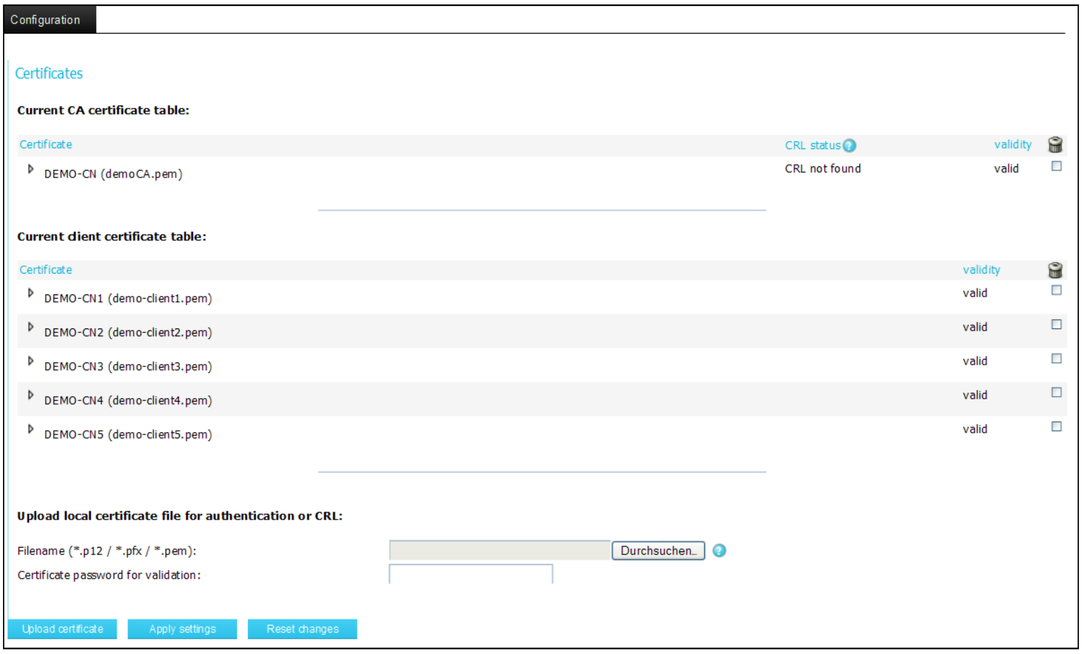
The "**Please wait**" dialogue shown when transmitting a page is not applicable here. Instead of the floppy-disk icon, a restart icon, which brings you back to the start page where you can perform a restart, will flash now.

Exceptional cases, for which the "**Please wait**" screen is displayed, are specific actions like the ping test or firmware updates.

Confirm your settings by pushing **Apply settings**.

CERTIFICATES

Access Point certificates are for authentication in respect of L2TP/IPSec, OpenVPN and the HTTPS Web server. On this web page of the Access Point certificate management, some demo certificates have already been filed just for test purposes.



Certificates

Current CA certificate table:

Certificate	CRL status	validity	
DEMO-CN (demoCA.pem)	CRL not found	valid	□

Current client certificate table:

Certificate	validity	
DEMO-CN1 (demo-client1.pem)	valid	□
DEMO-CN2 (demo-client2.pem)	valid	□
DEMO-CN3 (demo-client3.pem)	valid	□
DEMO-CN4 (demo-client4.pem)	valid	□
DEMO-CN5 (demo-client5.pem)	valid	□

Upload local certificate file for authentication or CRL:

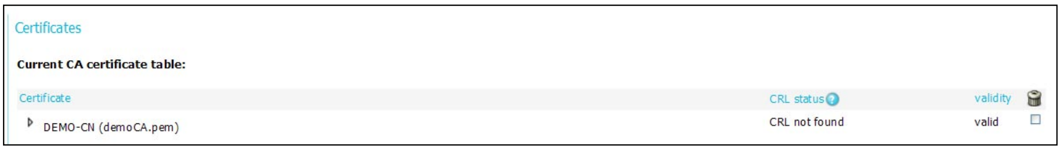
Filename (*.p12 / *.pfx / *.pem):

Certificate password for validation:

If a certificate is uploaded, its validity will be checked automatically. An invalid certificate the time and date range of which, for example, does not agree with the system time of the Access Point, will be displayed in the validity column as invalid. Hereupon, a question mark appears in relation to the invalid certificate via which further information on the system error message can be retrieved in the English language.

CRL-CERTIFICATES:

The CRL status of a certificate is indicated in the top line:



Certificates

Current CA certificate table:

Certificate	CRL status	validity	
DEMO-CN (demoCA.pem)	CRL not found	valid	□

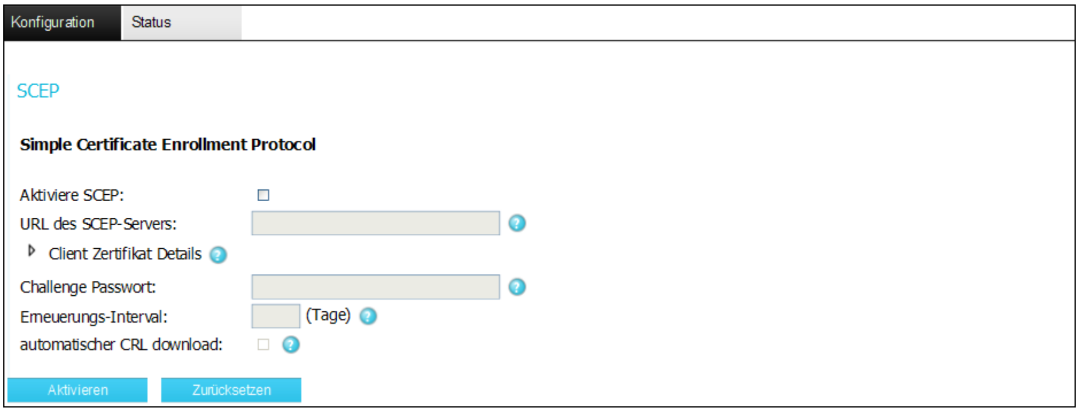
Individual certificates can appear as invalid if a certificate has been revoked by means of the CRL.

Hinweis:
A Client's certificate file must contain both a private key and a public part of certificates. The private key must be available in the RSA format.

Click on **Activate** to save your settings.

SCEP:

Allowing the use of an SCEP Certificate Service (e.g. Windows 2008 Server). When this function is used, a certificate is automatically allocated to the device.



SCEP

Simple Certificate Enrollment Protocol

Aktiviere SCEP: □

URL des SCEP-Servers:

Client Zertifikat Details

Challenge Passwort:

Erneuerungs-Interval: (Tage)

automatischer CRL download: □

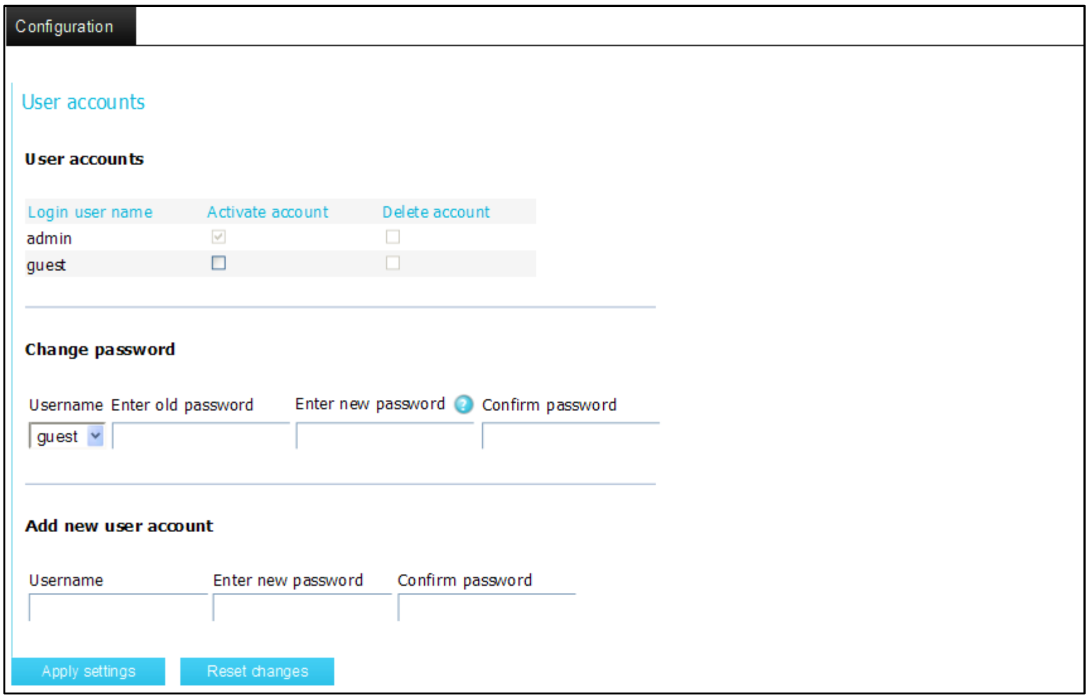
STATUS

Visualizes the certificate updating process.

8.7.1 ACCESS AUTHORIZATION

USER ACCOUNTS

The users of the device can be filed via the user accounts and be configured according to their authorization.



User accounts

User accounts

Login user name	Activate account	Delete account
admin	☑	□
guest	□	□

Change password

Username: guest
Enter old password:
Enter new password:
Confirm password:

Add new user account

Username:
Enter new password:
Confirm password:

User accounts

Enlisting currently configured user accounts. It is possible to deactivate the user accounts or to delete them completely.

By activation of the guest account, the user may view all settings of the device but he cannot change them.

If the guest account is activated without setting a new password, use the password **Guest.** When the guest password is set for the first time, **Guest** shall also be used as **Old password.**

Changing password

The password of the respective user account can be changed under **Change password.** The password defined hereunder is queried when the web interface is started by the browser. To change an already existing password, enter the current password in the box **Old password.** Choose a new password and confirm this again in the box **Password Confirmation.**

The predefined user **admin**, which cannot be deleted or activated, may as only user change the password of other users without having to enter an old password.

New user account

Allowing for the creation of a new user account. A user name and password must be defined. Click on **Activate** to create the account.

Note:

*The menu item User Accounts just serves the purpose of **Account Management.** Authorization for a user account is given under menu item **Variable Rights**.*

Note:

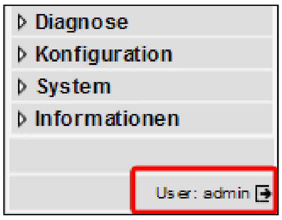
A newly created user account must be activated via the checkbox „Account active".

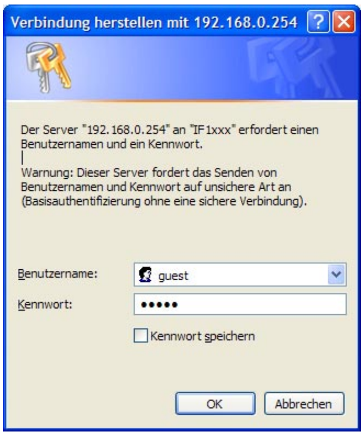
Changing the account:

To change between accounts, use the link **User:xxxx** at the end of the navigation bar. Now enter the required data for the account to be changed. Afterwards the new account will be active.

Note:

*This link can also be used to logout from the web interface. Confirm with **Cancel** in the next following dialogue window.*




Verbindung herstellen mit 192.168.0.254

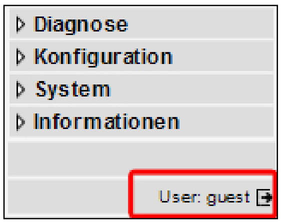
Der Server "192.168.0.254" an "IF1xxx" erfordert einen Benutzernamen und ein Kennwort.

Warnung: Dieser Server fordert das Senden von Benutzernamen und Kennwort auf unsichere Art an (Basisauthentifizierung ohne eine sichere Verbindung).

Benutzername: guest

Kennwort: •••••

□ Kennwort speichern



Note:

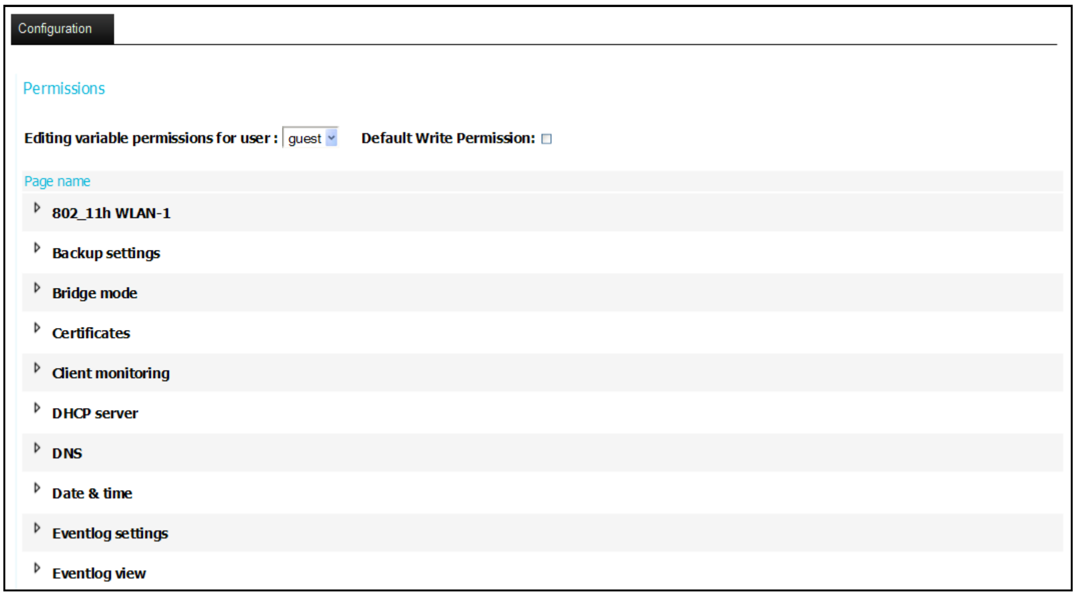
The chosen password must have 4-20 characters. Valid characters are: 0-9, A-Z, a-z, and „-._# /@".

Note:

If you have used the browser-specific option "Save Password", it is possible that you can't logout properly via this link. In this case deactivate the setting in your browser or select the respective option in your browser to delete the active authentication.

PERMISSIONS

Via Permissions, newly created user accounts can be granted appropriate writing rights, such as writing access to certain fields. As an example, the user account **Test** was created that is now to be configured accordingly.



Permissions

Editing variable permissions for user : guest

Default Write Permission: □

Page name
- 802_11h WLAN-1
- Backup settings
- Bridge mode
- Certificates
- Client monitoring
- DHCP server
- DNS
- Date & time
- Eventlog settings
- Eventlog view

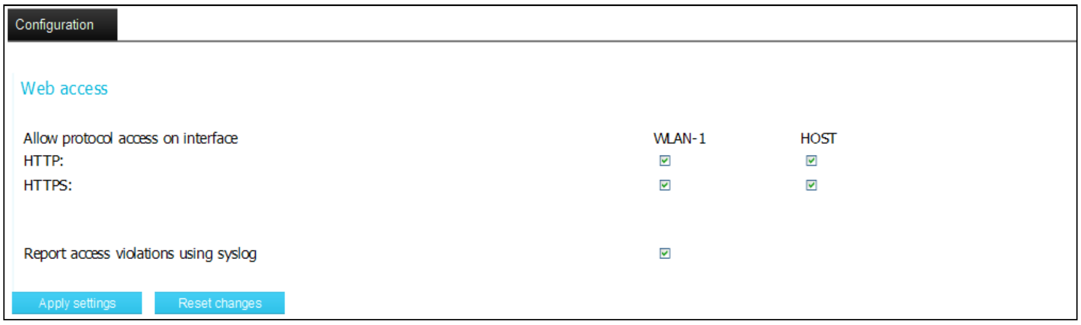
Each setting can be opened by one click. Use the checkbox of the various settings to define in which fields writing rights are to be granted.

All settings made must be confirmed by **Activate.**

To create an additional admin account with the same features as the default admin account, click on the checkbox **„Writing Access Standard Setting.** In one point however this admin account differs from the user „**admin**“: only the user „**admin**“ may change the password of other users without knowing the old password. If you use the option „**Writing Access Standard Setting**“, you may setup exceptions from these writing rights by deleting them under individual variable rights in the selection box.

Web Access

The **Web Interface Access Control** allows setting the access via HTTP and HTTPS at the available HOST or HOST interface, depending on the operation mode. Further, it is possible to set whether access violations shall be reported via the event log



Web access

Allow protocol access on interface	WLAN-1	HOST
HTTP:	☑	☑
HTTPS:	☑	☑

Report access violations using syslog ☑

(View of Transparent Bridge)

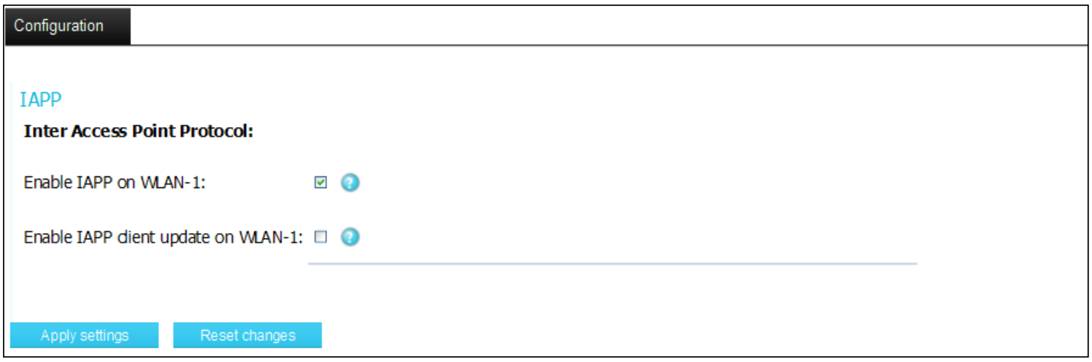
To deny access, remove the checkmark of the respective option.

Confirm your changes by clicking on **Activate.**

8.7.2 ADV. WLAN

IAPP

IAPP is used for exchanging control and additional information between Access Points (APs). An AP, for instance sends an IAPP notification to all other APs in the network if a client logs in. Then, as a result, all other APs can remove this client from their table of logged in clients. The LLC Xid packets, also originally defined in IAPP, are always transmitted if a client logs in, independent on this setting.



IAPP

Inter Access Point Protocol:

Enable IAPP on WLAN-1: ☑

Enable IAPP client update on WLAN-1: □

Enable IAPP

Enables IAPP broadcasts and receiving of IAPP messages on APs.

Enable IAPP client update

Enables a specific ads-tec extension of the IAPP protocol. In this case, 802.11 beacon data will additionally be sent as an IAPP broadcast via Ethernet in 1 second intervals. Ads-tec clients are able to receive this information and will in this way learn the state and the current channel of all APs, even if they might not be visible per radio yet. This information is primarily required for fast roaming processes in order to automatically process the channel resolution in the 5 GHz band. Therefore, this option is only useful if fast roaming is applied.

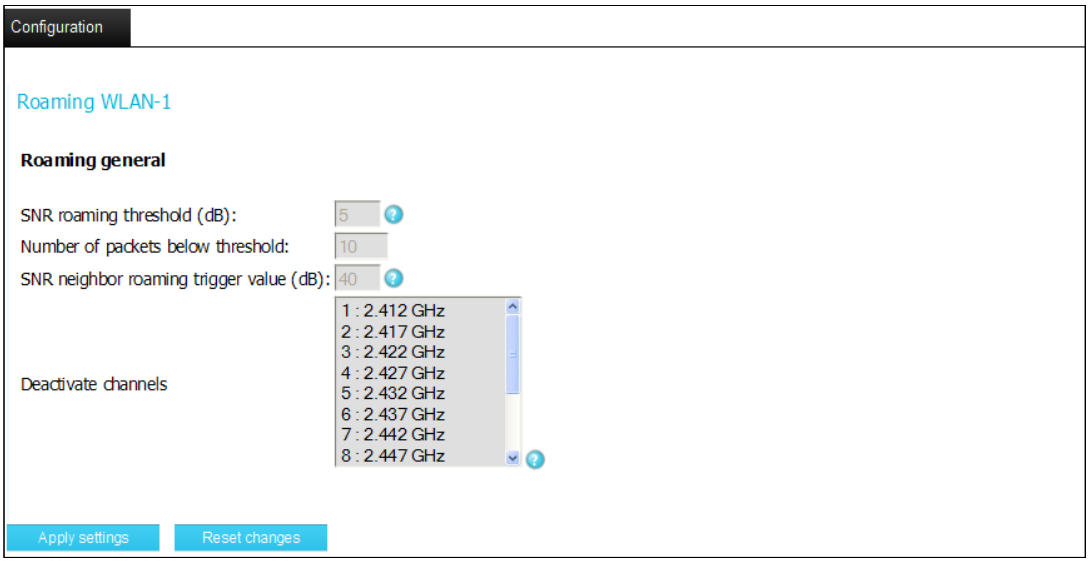
Note:

The IAPP (Internet Access Point Protocol) was incomplete when it was defined as 802.11f by the IEEE; this draft was later withdrawn. As a result, IAPP is no standardised protocol.

ROAMING WLAN-1

General info about roaming:

Roaming is always used in those cases where the client moves around in a large area, covered by more than one Access Point. Compared with point-to-point radio links and other PPP connections, which in most cases have a fixed channel selection, clients must be able to find several access points on different channels in case of a roaming setup. Settings on this page allow specifying the transition from one to another network for trouble-free and optimised function.



Roaming WLAN-1

Roaming general

SNR roaming threshold (dB): 5

Number of packets below threshold: 10

SNR neighbor roaming trigger value (dB): 40

Deactivate channels
1 : 2.412 GHz
2 : 2.417 GHz
3 : 2.422 GHz
4 : 2.427 GHz
5 : 2.432 GHz
6 : 2.437 GHz
7 : 2.442 GHz
8 : 2.447 GHz

SNR roaming threshold (dB):

This threshold specifies, starting from which dB value roaming is initiated. As soon as the dB value falls short of the value specified, the roaming process will start.

Number of packets below threshold:

Specifies the quantity of packages for the underflow of the value.

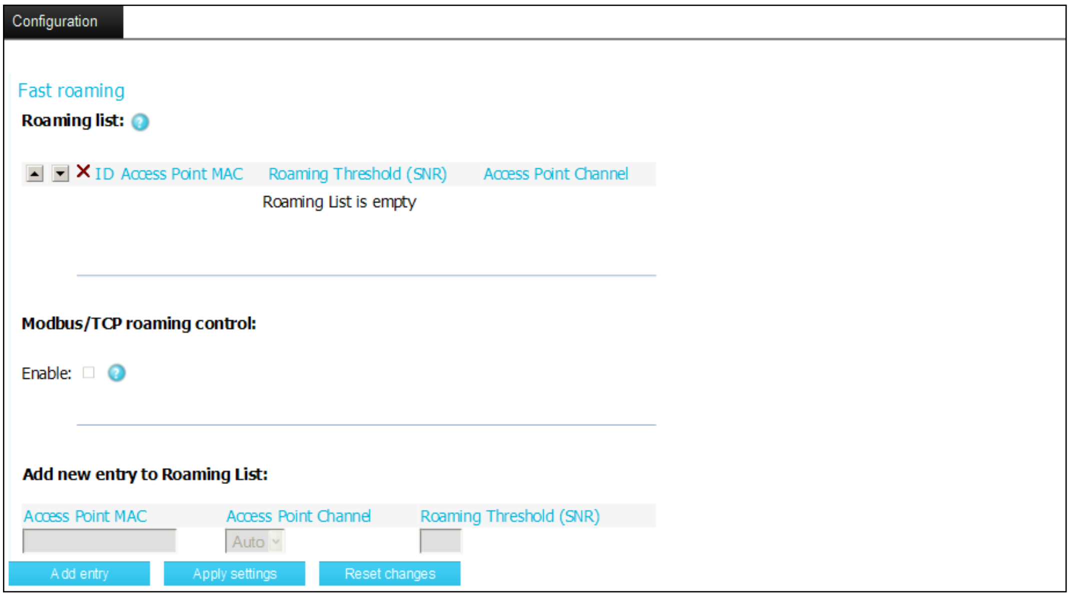
SNR neighbour roaming trigger value:

The client is also processing packets from other Access Points on the same or on neighbour channels. Roaming with such an Access Point will be initiated as soon as packets are received, the SNR value of which is better.

➔ ***Note:***
A more detailed description for optimised roaming function configuration is shown in the "Advanced roaming parameters" application example.

FAST RAOMING

The Fast roaming function allows a specific log-in to an existing Access Point without initiating a scanning process.



Roaming list:

The roaming list contains all Access Points to which a connection is to be established. The list will be processed in the given order. The first entry is used for the first connection attempt.

Modbus/TCP roaming control:

Enables the clients Modbus/TCP API. A PLC can then retrieve the current position in the roaming list or can initiate fast roaming to any entry in the roaming list.

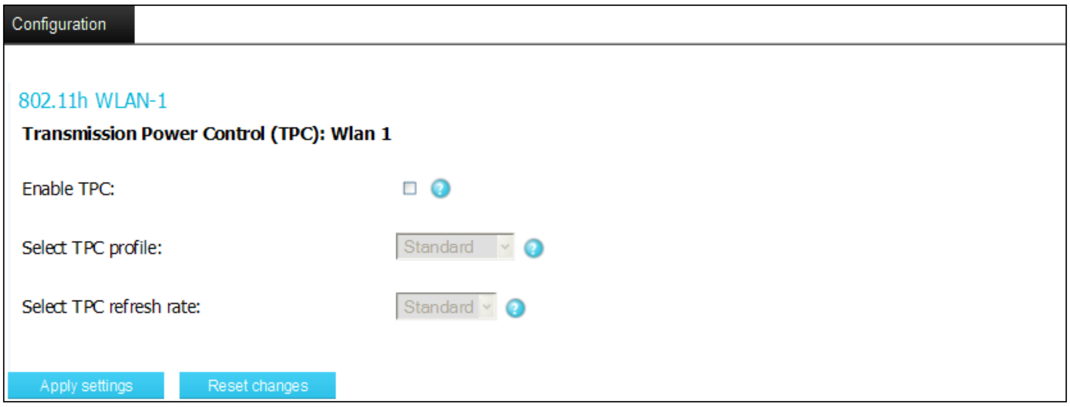
Add new entry to Roaming List:

Allows entering an Access Point in the roaming list. The MAC address of this Access Point is required to enter. Furthermore, the channel (1-13) on which the Access Point can be reached may be entered. If the channel is unknown, you may select the Auto option.

The Fast roaming page also supports Access Points (Aps) of other manufacturers. This will be continued, and is even required for processing dynamic channels, in particular in the 5 GHz band and including DFS. The APs channel may statically be preset on 2.4 GHz or with 5 GHz with the DFS option disabled. The client will then only process these APs in the given order and with the given roaming thresholds. If the device cannot jump to a certain AP, the device will go in default scan mode, and the remaining roaming parameters, like e.g. the "Disabled channels", will be enabled.

802.11H WLAN-1

The 802.11h standard defines an extension of the IEEE 802.11 WLAN standard in order to allow communication on the 5 GHz band according to the regulation in Europe. The standard contains two components: DFS: (Dynamic Frequency Selection) and TPC (Transmission Power Control). DFS is already configured on the Standard WLAN page.



802.11h WLAN-1

Transmission Power Control (TPC): Wlan 1

Enable TPC: □

Select TPC profile: Standard

Select TPC refresh rate: Standard

ENABLE TPC:

Transmission Power Control aims at reducing the transmission power of a device as much as possible. TPC is always activated if a 5 GHz channel is used; TPC cannot be switched off in this case. In the 2.4 GHz band, TPC is not active by default, but may be enabled if desired.

Select TPC profile:

- Standard: Optimises transmission power for a data rate of 48 Mbit/sec.
- Max. Power: Optimises transmission power for a data rate of 54 Mbit/sec.
- Min. Power: Optimises transmission power for a data rate of 11/12 Mbit/sec.

Select TPC refresh rate:

Fast moving clients should use a high refresh rate, or the connection might be terminated. The low rate may be used for static connections.

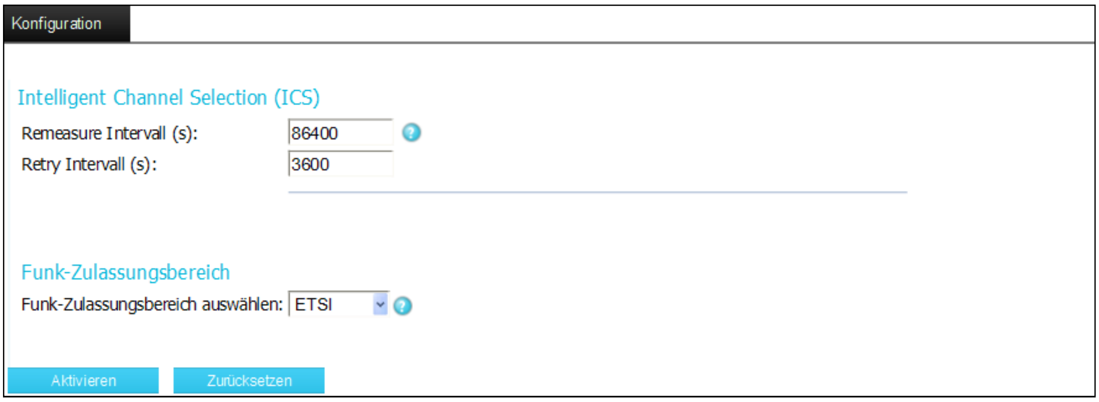
24h scan start time:

DFS requires to disable the WLAN every 24h and to search the available channels for radar signals for at least one minute. In order to avoid that this required downtime falls into a critical time of the day, you can select the point in time when the 24h scan should be carried out.

Note:

This DFS option is not available with FCC.

8.7.3 SONSTIGES



Intelligent Channel Selection (ICS)

Remeasure Intervall (s): 86400

Retry Intervall (s): 3600

Funk-Zulassungsbereich

Funk-Zulassungsbereich auswählen: ETSI

Re-measure Interval:

The Re-measure Interval indicates when a device shall re-measure its surrounding. The measurement is only performed when no Client is logged in. If a Client is logged in, a new trial is started after Retry Interval seconds. During measurement, the AP is not available for WLAN Clients.

Retry Interval:

If a Client is logged in, the re-measuring process is restarted after this interval. If no Clients are logged in at the Access Point, the latter can start the re-measuring process.

➔ ***Note:***

The Re-measure function can be deactivated in both boxes with the value 0.

Permitted radio range:

Here the regional settings for the transmission power valid in the respective countries are made.

⚠ ***Warning:***

It is the duty of the operator of the device to select the correct regional settings.

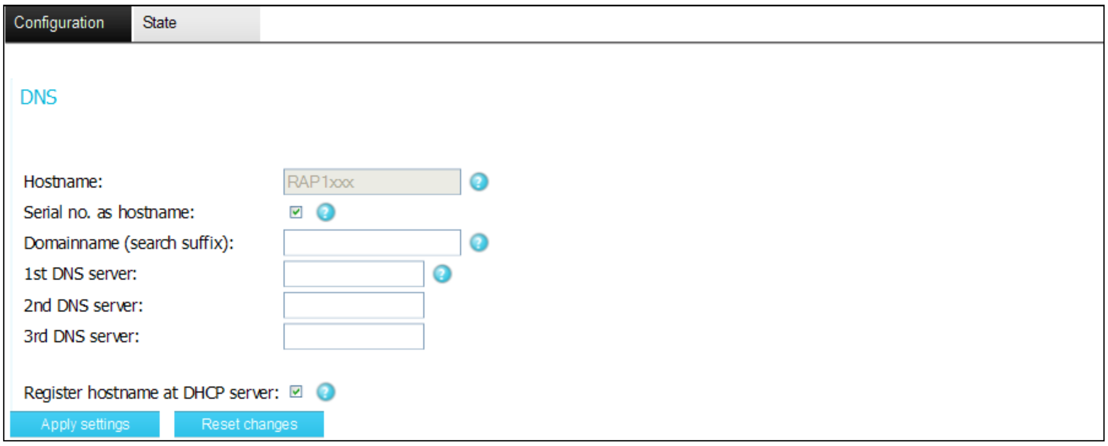
8.7.4 NETWORK

DNS

The name server and the host name of the device are configured on the new DNS page. The name server is only used if a host name is used in a field for IP addresses of a server (e.g. NTP server) instead of an IP address. In the event log the host name is used as a prefix.

Serial number as host name:

This option is activated as standard and indicates the system name and the serial number of the device.



DNS

Hostname: RAP1xxx

Serial no. as hostname: ☑

Domainname (search suffix):

1st DNS server:

2nd DNS server:

3rd DNS server:

Register hostname at DHCP server: ☑

Host name:

The DNS host name of the device itself is used for example for event log messages.

Serial number as host name:

This option is activated as standard and allows the serial number of the device to be used as system name.

Domain name (search-suffix):

The search-suffix is attached to all DNS enquiries.

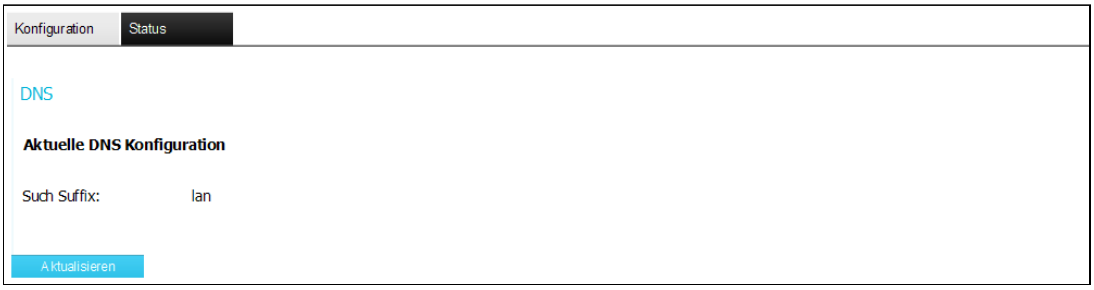
DNS server:

There must be configured at least one DNS server to resolve host names in IP addresses. This is used by the device to resolve all host names which can be defined for various parameters.

Registered host name at the DHCP server:

With every DHCP request of the device, the defined host name will also be transmitted to the DHCP server, if activated.

STATUS:



DNS

Aktuelle DNS Konfiguration

Such Suffix: lan

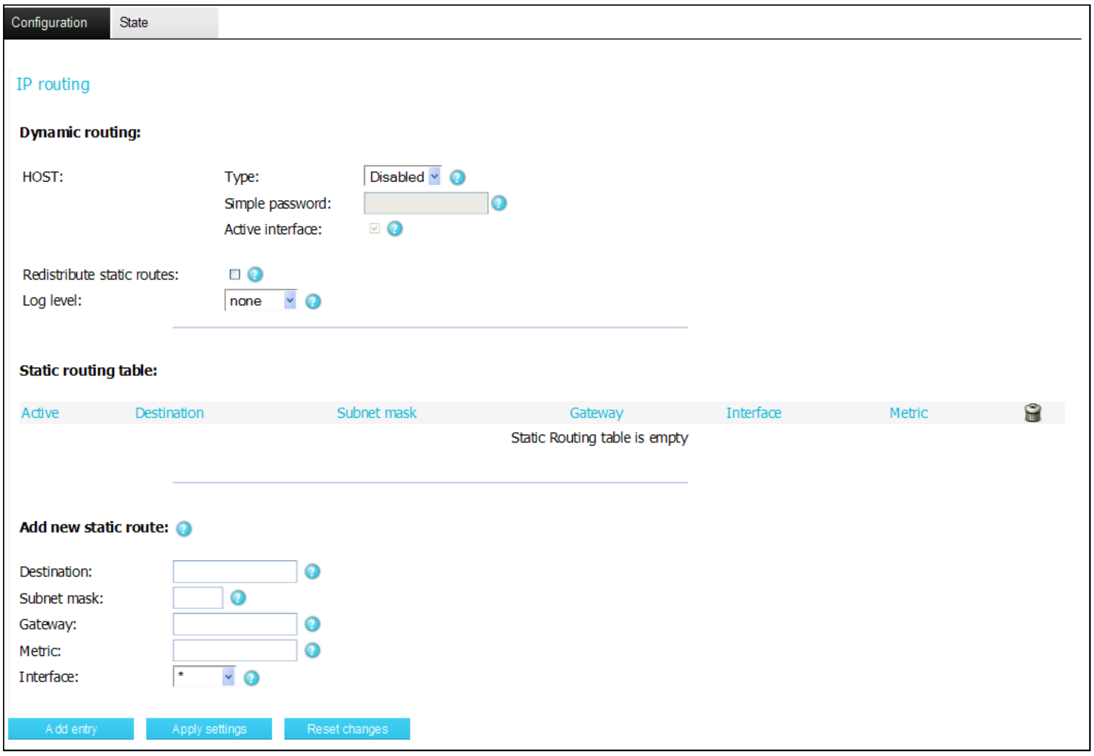
Note:

If the DHCP server supports dynamic DNS updates after RFC2136, this will lead to a valid DNS entry for the given host name on the DNS server.

Note:

If the interface is configured with DHCP, the manually made settings are dynamically overridden here.

IP ROUTING



IP routing

Dynamic routing:

HOST:
Type: Disabled
Simple password:
Active interface: ☑

Redistribute static routes: □
Log level: none

Static routing table:

Active	Destination	Subnet mask	Gateway	Interface	Metric

Static Routing table is empty

Add new static route:

Destination:
Subnet mask:
Gateway:
Metric:
Interface: *

Dynamic routing type:

In this setting you can set up a specific protocol for IP routing to be used. Available for selection are

RIP:

Frequently used protocol, which allows creating routing tables for routers.

OSPF:

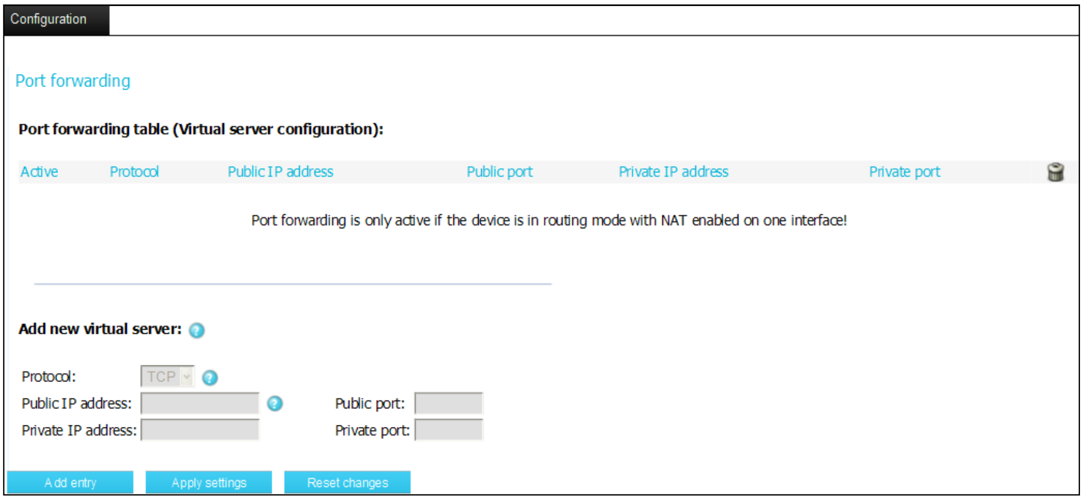
Open Shortest Path First is the RIP protocol successor.

Both: Is using both protocol types.

IP routing is used in order to forward IP packets, which belong to a certain network, to a gateway computer. A network consists of an IP address and the corresponding subnet mask. The values must be entered under Destination and Subnet mask. Additionally, the Gateway must be specified if both networks to be connected are based on different protocols.

PORT FORWARDING

By using the **Port forwarding** menu item, it is possible to forward or initiate connections by using freely selectable ports connected to computers/addresses within the same network.



Port forwarding

Port forwarding table (Virtual server configuration):

Active	Protocol	Public IP address	Public port	Private IP address	Private port

Port forwarding is only active if the device is in routing mode with NAT enabled on one interface!

Add new virtual server:

Protocol: TCP
Public IP address:
Public port:
Private IP address:
Private port:

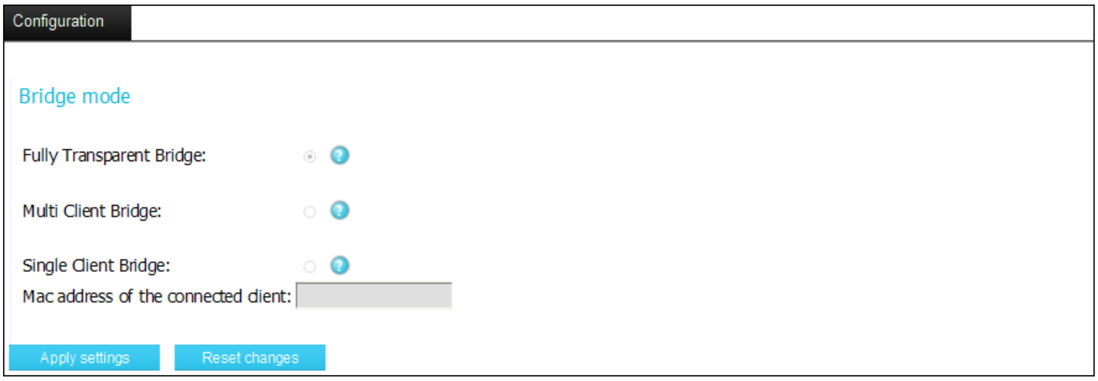
With port forwarding rules can be defined, forward the incoming Ethernet packets. Thus, it is possible the "disguised" services (ports) to speak directly behind the unit from the WLAN network out, without knowing its IP address. Port forwarding is used only in the router operating modes. Most important, it gets in combination with NAT and Extendend background scanning and IP router.

➔

Note:
For further information see the respective application example

BRIDGE MODE

If the device is used in Transparent bridge mode, the Bridge mode allows making more detailed settings.



Bridge mode

Fully Transparent Bridge: ●
Multi Client Bridge: ○
Single Client Bridge: ○
Mac address of the connected client:

Fully transparent bridge mode:

This mode is the default transparent bridge mode, which can also be selected in the filter wizard.

Multi client bridge:

This operating mode allows to use a WLAN client in connection with a non-ads-tec Access Point. All devices connected with the Ethernet interface of the ads-tec device, are automatically masked with the MAC address of the WLAN module of the ads-tec device in the direction of the WLAN. The first device is masked with a layer2-transparent access, and all further devices are masked with a layer3-transparent access, i.e. only protocol data might be transmitted.

Single client bridge:

Exactly one Ethernet device, which is masked with a layer2-transparent access, may be connected behind the client, in this case. The MAC address of this device must be manually entered.

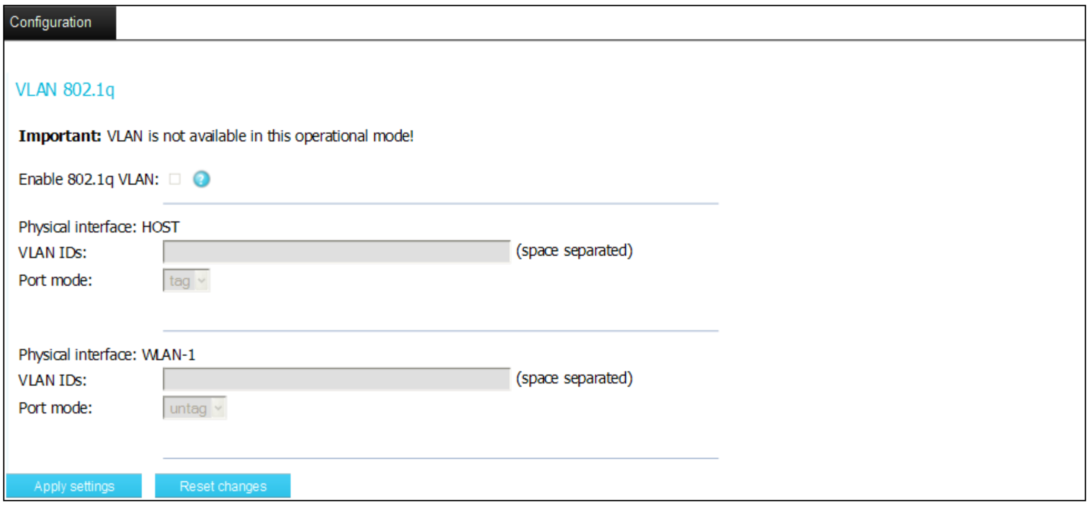
Note:

If the ads-tec device itself is configured as a DHCP client in the Single bridge mode or in the Multi client mode, all other connected devices may also use DHCP. The ads-tec device will automatically initiate DHCP relay in order to forward all corresponding requests.

VLAN 802.1q

VLAN ID (VLAN tags) can be used by means of the integrated firewall mechanisms to setup virtual subnetworks and to separate data traffic. To this end, every subnetwork uses a unique number (VLAN-ID) to this end to identify Ethernet packets. A device belonging to VLAN with ID=1 is able to communicate with each other device in the same VLAN but not with a device in another VLAN with ID=2, 3, ... In addition, prioritization with VLAN is also possible. Each frame can be given a priority (see menu item Prioritization). This makes possible, for example, to preferably transfer control data while HTTP data are thwarted.

The firewall uses an uplink port from where the packets are exactly transferred to another target port. A packet arriving at the target port is output at the uplink port with the respective VLAN ID. That means, there is always setup a VLAN network between uplink and another port via the port-related VLAN ID.



VLAN 802.1q

Important: VLAN is not available in this operational mode!

Enable 802.1q VLAN: □

Physical interface: HOST
VLAN IDs: (space separated)
Port mode: tag

Physical interface: WLAN-1
VLAN IDs: (space separated)
Port mode: untag

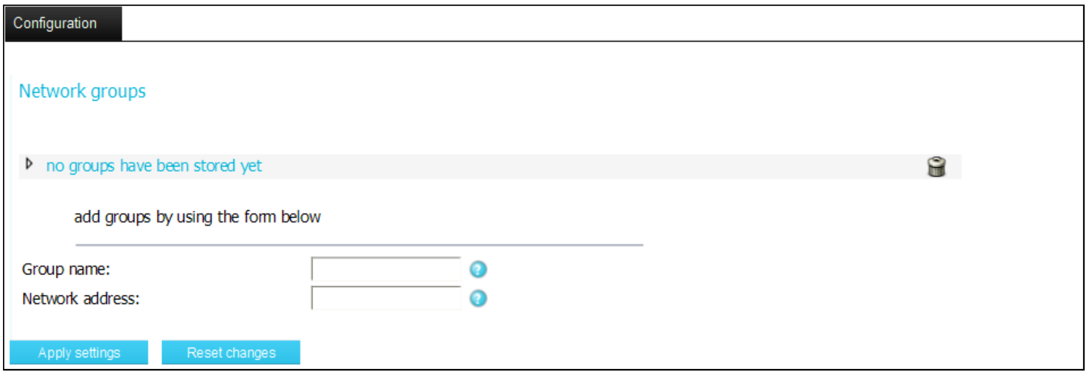
The VLAN functionality according to 802.1q is activated with the option Activate 802.1q VHOST.

The option Activate Input Filter refuses all packets with VLAN IDs which do not match the port VLAN ID.

The VLAN tags are removed or deleted at a target port by means of the option Delete ID of outgoing packets. Incoming packets at the port without ID are provided with the VLAN ID of the port. Thus a device needs no special VLAN configuration at the target port.

The VLAN ID for the the HOST interface as well as for the four ports of the managed switch HOST is input in the following boxes.

Network-Groups



Network groups

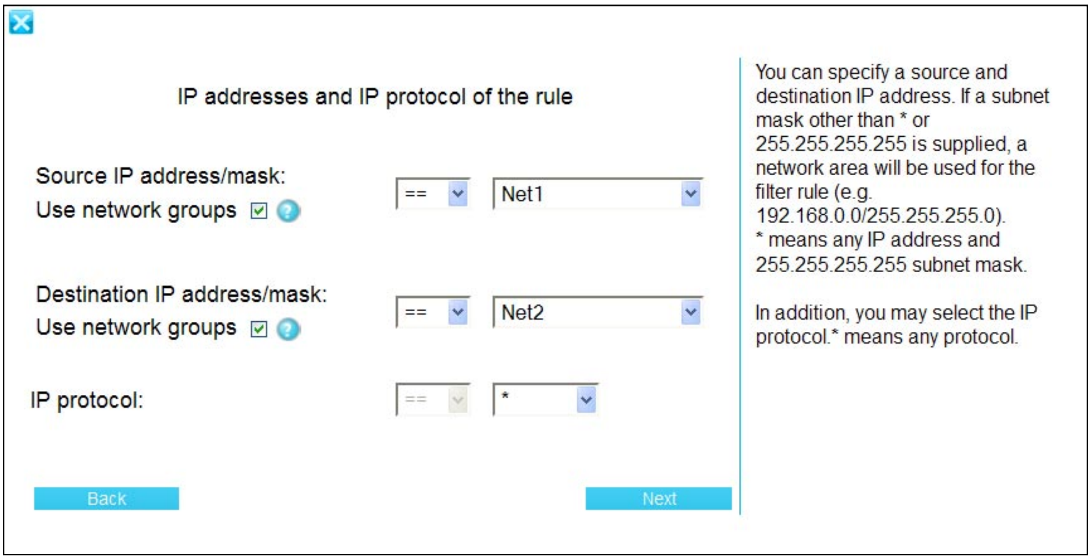
▸ no groups have been stored yet

add groups by using the form below

Group name:

Network address:

The Network Groups function allows for grouping IP addresses and IP sub-networks to use them in the packet filter for filter rules. The status line contains information on the use of the group. If a group in the packet filter is used once normally the status line „Use in Rule 1" is output.



IP addresses and IP protocol of the rule

Source IP address/mask: == Net1

Use network groups ☑

Destination IP address/mask: == Net2

Use network groups ☑

IP protocol: == *

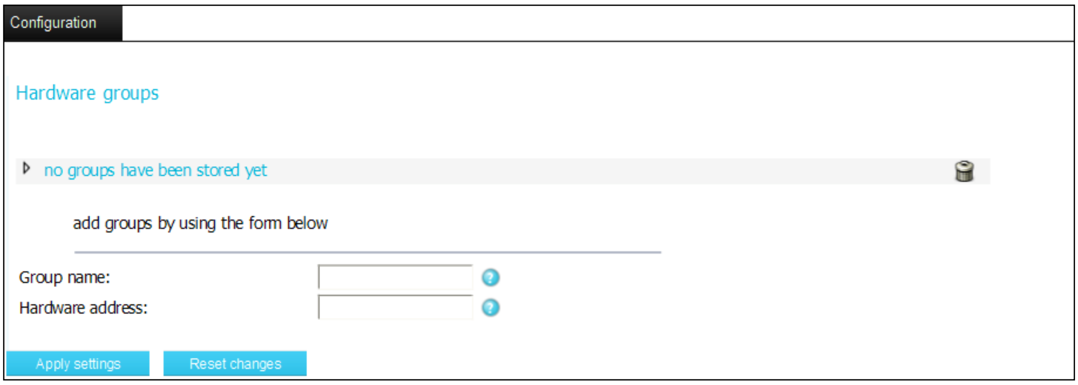
You can specify a source and destination IP address. If a subnet mask other than * or 255.255.255.255 is supplied, a network area will be used for the filter rule (e.g. 192.168.0.0/255.255.255.0). * means any IP address and 255.255.255.255 subnet mask.

In addition, you may select the IP protocol.* means any protocol.

Note:

*The use of **!=** in Layer2 Filter Wizard for network groups is not supported.*

HARDWARE-GROUPS



Hardware groups

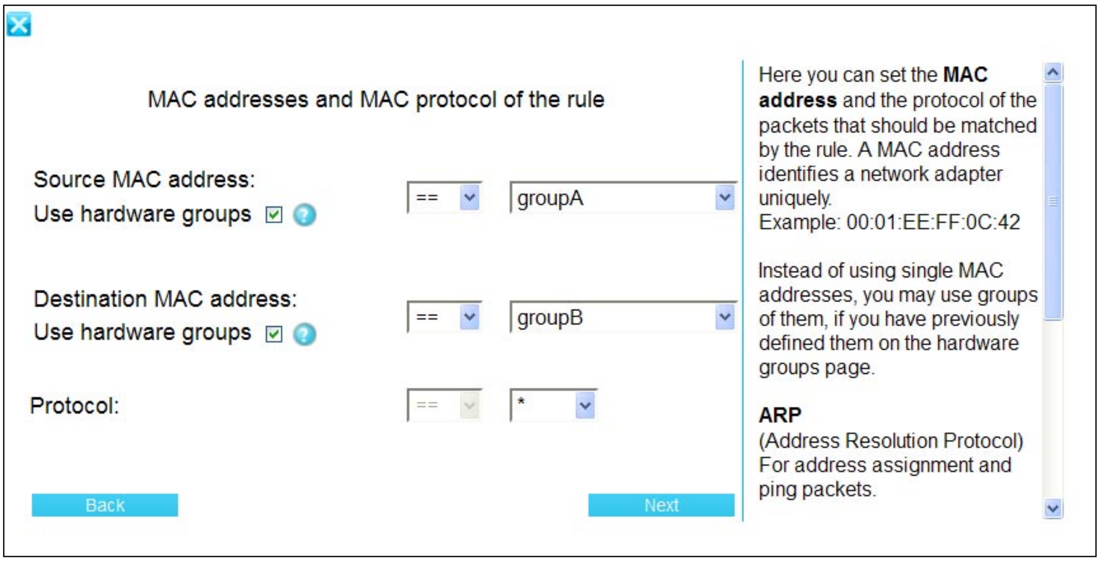
no groups have been stored yet

add groups by using the form below

Group name:

Hardware address:

The Hardware Group function allows for grouping MAC addresses to use them in the packet filter for filter rules. The status line contains information on the use of the group. If a group in the packet filter is used once the status line "Use in Rule 1" is output.



MAC addresses and MAC protocol of the rule

Source MAC address: == groupA

Use hardware groups ☑

Destination MAC address: == groupB

Use hardware groups ☑

Protocol: == *

Here you can set the **MAC address** and the protocol of the packets that should be matched by the rule. A MAC address identifies a network adapter uniquely.
Example: 00:01:EE:FF:0C:42

Instead of using single MAC addresses, you may use groups of them, if you have previously defined them on the hardware groups page.

ARP
(Address Resolution Protocol)
For address assignment and ping packets.

➔

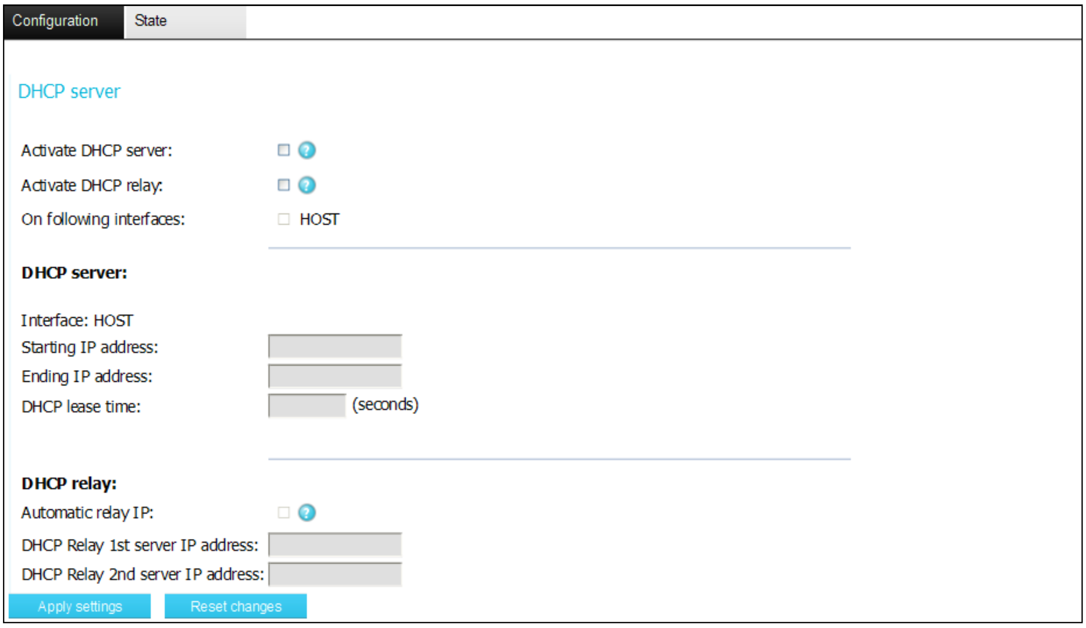
Note:

Hardware groups can only be used in Layer2 rule sets because a filtration for MAC addresses is only possible there

8.7.5 SERVICE

DHCP SERVER

The built-in DHCP server can be used for distributing IP addresses. By default it is, however, turned off and may be activated by using the **Activate DHCP server** option.



DHCP server

Activate DHCP server: □

Activate DHCP relay: □

On following interfaces: □ HOST

DHCP server:

Interface: HOST

Starting IP address:

Ending IP address:

DHCP lease time: (seconds)

DHCP relay:

Automatic relay IP: □

DHCP Relay 1st server IP address:

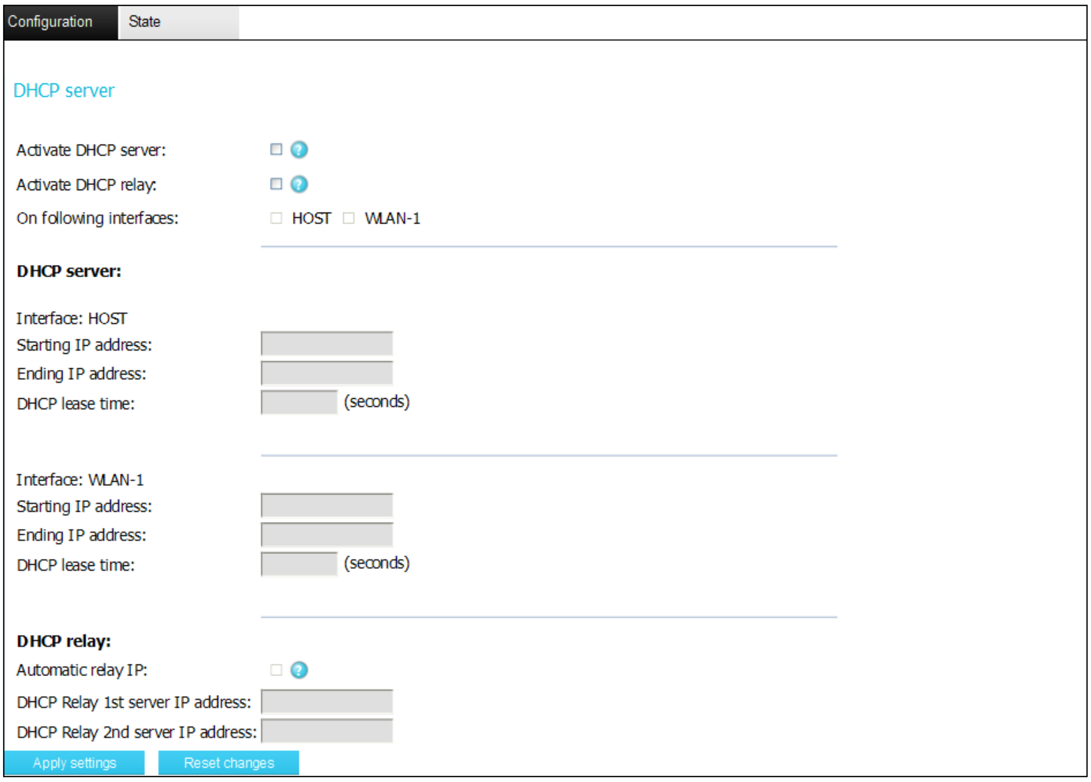
DHCP Relay 2nd server IP address:

Note:

The range of IP addresses must be within the same range like the IP address of the interface used!

The interfaces, on which the DHCP server should respond to client requests, may be specified in the **On following interfaces** options in more detail. The pool range can be set up separately for each interface.

Additionally to distributing IP addresses, the DHCP server can also transmit a domain search prefix and three DNS server addresses in server mode. This information is forwarded to DHCP clients. The device is using an internal DNS utility in order to buffer all enquiries. Should the Access Point not work with its own static IP address but as a DHCP client, this data will be overwritten by the DHCP server used in that case.



DHCP server

Activate DHCP server: □

Activate DHCP relay: □

On following interfaces: □ HOST □ WLAN-1

DHCP server:

Interface: HOST

Starting IP address:

Ending IP address:

DHCP lease time: (seconds)

Interface: WLAN-1

Starting IP address:

Ending IP address:

DHCP lease time: (seconds)

DHCP relay:

Automatic relay IP: □

DHCP Relay 1st server IP address:

DHCP Relay 2nd server IP address:

(figure IP-Router)

DHCP RELAY:

In the IP router mode, you have the opportunity to Enable a DHCP relay server as an alternative to the DHCP server. The DHCP relay server is used for forwarding DHCP requests via an Ethernet segment. All interfaces, on which DHCP requests are received, as well as the interface, on which the actual DHCP runs, must be selected in DHCP relay mode.

Automatic relay IP:

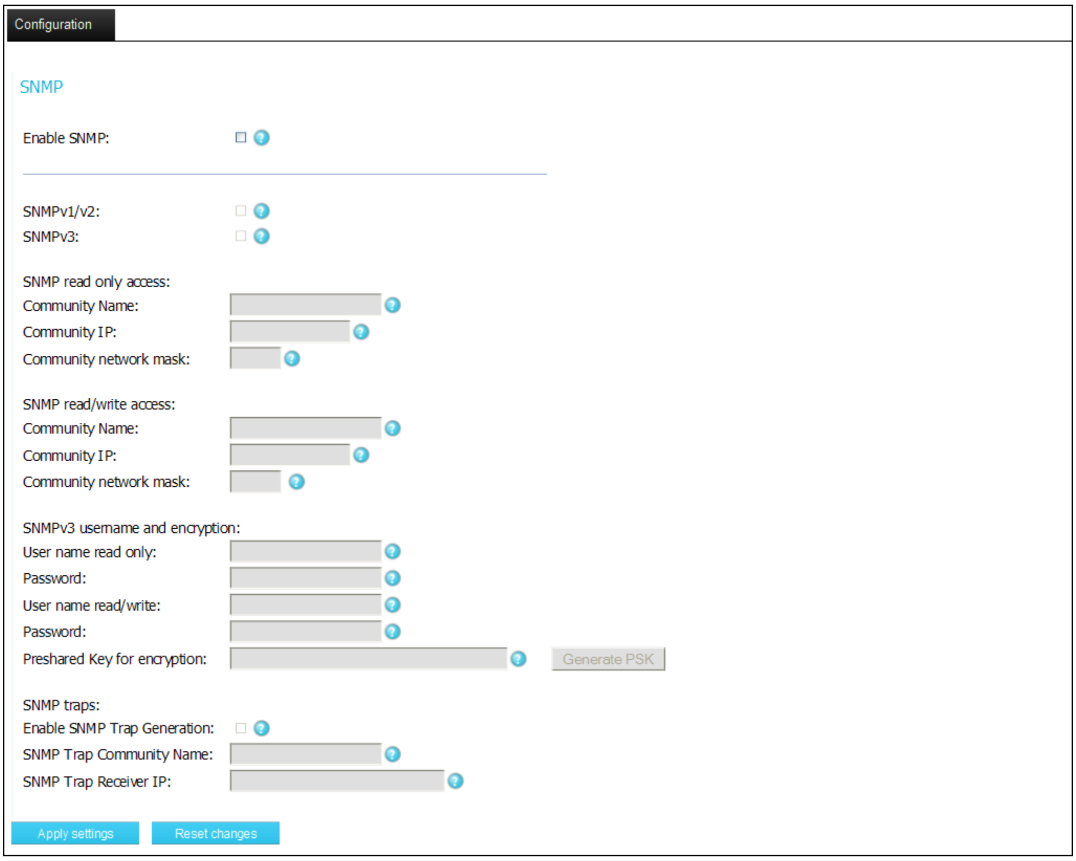
If this function is activated, the firewall itself works as a DHCP server and responds to requests from the selected interface.

Relay IP address:

Here you'll have to enter the IP address of the DHCP server.

SNMP

Using the Simple Network Management Protocol (SNMP) allows to administrate and monitor network resources like routers, switches or servers via a central location. This protocol does not only control communication between the monitored device and the monitoring station but also allows error recognition and notification.



SNMP

Enable SNMP: □

SNMPv1/v2: □
SNMPv3: □

SNMP read only access:
Community Name:
Community IP:
Community network mask:

SNMP read/write access:
Community Name:
Community IP:
Community network mask:

SNMPv3 username and encryption:
User name read only:
Password:
User name read/write:
Password:
Preshared Key for encryption:

SNMP traps:
Enable SNMP Trap Generation: □
SNMP Trap Community Name:
SNMP Trap Receiver IP:

Enable SNMP:

Enables or disables SNMP protocol.

SNMPv1/v2:

With SNMP activated the first or second protocol version is used. These are, however, not encrypted and thus not secure enough.

SNMPv3:

With SNMP activated, the third SNMP-protocol version is used. It provides additional protection by assigning User name and Password.

SNMP READ ONLY ACCESS / SNMP READ/WRITE ACCESS:

> ***Note:***
> *Select if you want to configure read-only or read/write access rights according to your requirements, and fill your data in the corresponding mask.*

SNMP Community Name:

The name to be entered here is comparable with a password. Frequently used default settings are Private or Public.

SNMP Community IP:

Access to the specified Community Name is restricted to the following IP address.

> ***Note:***
> *If you want to allow all source IPs, select the following IP: **0.0.0.0***

SNMP Community network mask:

Here you must enter the corresponding network mask for this IP address.

SNMPv3 USERNAME AND ENCRYPTION:

> ***Note:***
> *This function is available only if SNMPv3 was selected. Select if you want to configure read-only or read/write access rights according to your requirements, and fill your data in the corresponding mask.*

User name:

Assign a user name for authentication with the SNMPv3 protocol.

Password:

Assign a password to your user name.

> ***Note:***
> *The authentication protocol used with this login is MD5.*

Preshared Key for encryption:

The preshared key (PSK) is a key that consists of a combination of numbers and letters and can be used in addition to user name and password. A randomly generated number code, which may be used as a preshared key, can be created by using the "**Generate PSK**" button.

ENABLE SNMP TRAP GENERATION:

Allows to enable/disable the SNMP trap function. With the function enabled, events like e.g. Link Up / Link Down events can be received and traced back. The firewall can trace back, from which device the message originated, because its IP address is included.

SNMP Trap Community Name:

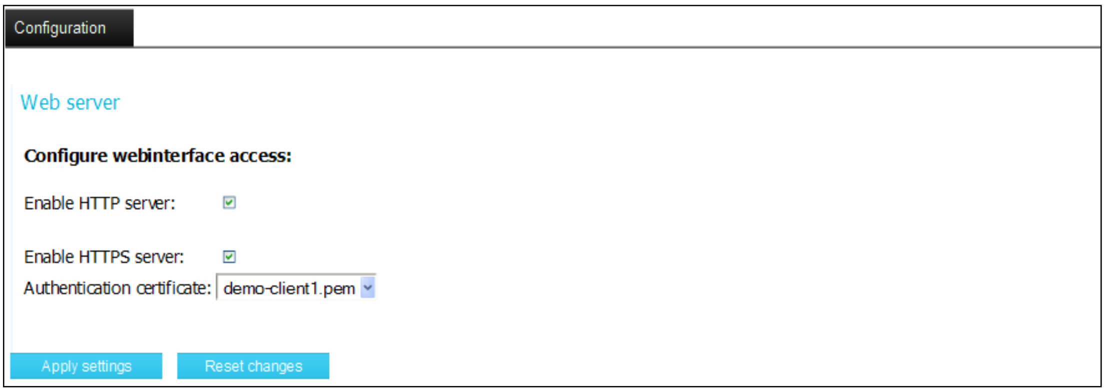
Here you enter the Community Name for traps.

SNMP Trap Receiver IP:

Enter the IP address of the trap receiver here.

WEBSERVER

Access to the Access Point web interface using the protocols http or https can be set up using the Webserver > Access control menu.



Configure webinterface access:

Enable HTTP server: ☑

Enable HTTPS server: ☑

Authentication certificate: demo-client1.pem

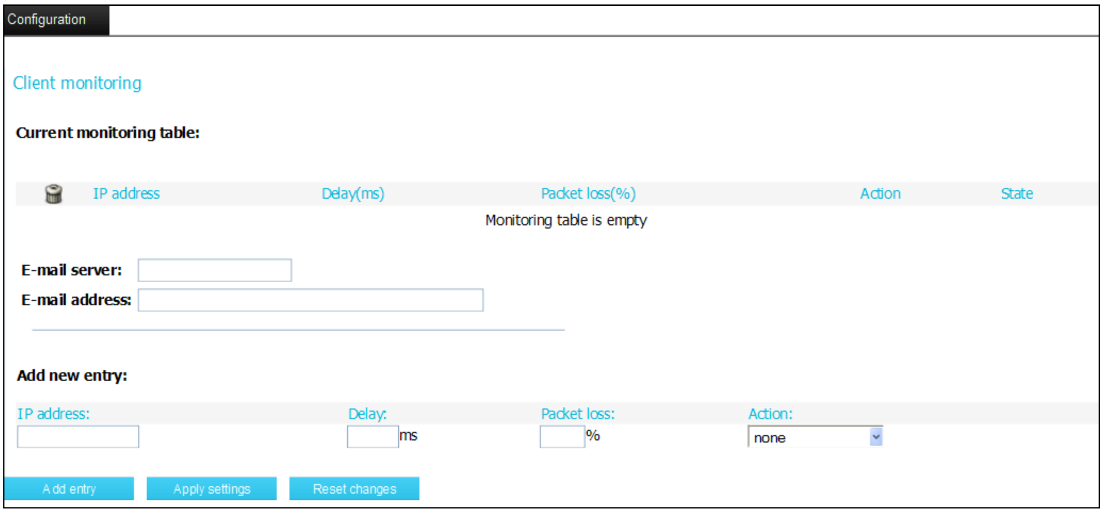
The web server integrated in the Access Point for configuration can only be reached using the activated protocols.

➔ ***Note:***

You should assign an individual certificate to each Access Point for an optimum in security.

CLIENT MONITORING

The integrated client monitoring functionality is used for monitoring terminals for their availability in the network. The clients to be monitored are added to the Current monitoring table and will be checked for availability by ICMP messages in regular cycles.



Client monitoring

Current monitoring table:

	IP address	Delay(ms)	Packet loss(%)	Action	State
			Monitoring table is empty		

E-mail server:

E-mail address:

Add new entry:

IP address:	Delay:	Packet loss:	Action:
	ms	%	none

A client to be monitored can initiate an activity if it is no longer available. This action could e.g. be to send an email to the respective person in charge.

Action:

up /down WLAN-1/2

Using this setting, the WLAN adapter is shut down if the Ethernet terminal can no longer be reached via ICMP. If the ICMP is now carried out at the gateway of the AP, the AP can recognise that it has no longer an uplink available. The WLAN interface will shut down and log off all clients. Otherwise it might happen that a client logs in, although the AP has no connectivity, while the client should rather look for another AP.

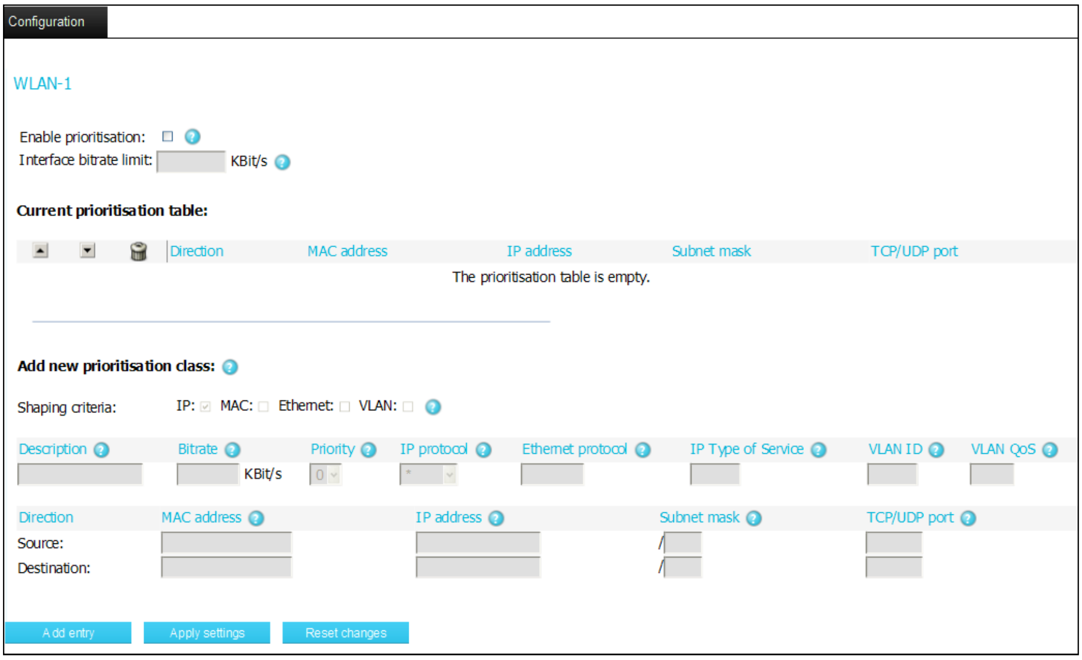
Note:
If you want to check the response time for ICMP responses you can pop up a tooltip on the LED icon in the State box.

Note:
A change in state will trigger an E-mail notification if a valid address is saved in the optional E-mail server and E-mail address boxes.

8.8 PRIORITISATION

WLAN 1

The prioritisation function integrated in the Access Point is used for differentiated treatment of data flows between different interfaces. This way, it is possible to prioritise packets or to limit the bandwidth for certain protocols.



WLAN-1

Enable prioritisation: □

Interface bitrate limit: KBit/s

Current prioritisation table:

			Direction	MAC address	IP address	Subnet mask	TCP/UDP port

The prioritisation table is empty.

Add new prioritisation class:

Shaping criteria: IP: ☑ MAC: □ Ethernet: □ VLAN: □

Description	Bitrate	Priority	IP protocol	Ethernet protocol	IP Type of Service	VLAN ID	VLAN QoS
	KBit/s	0	*				

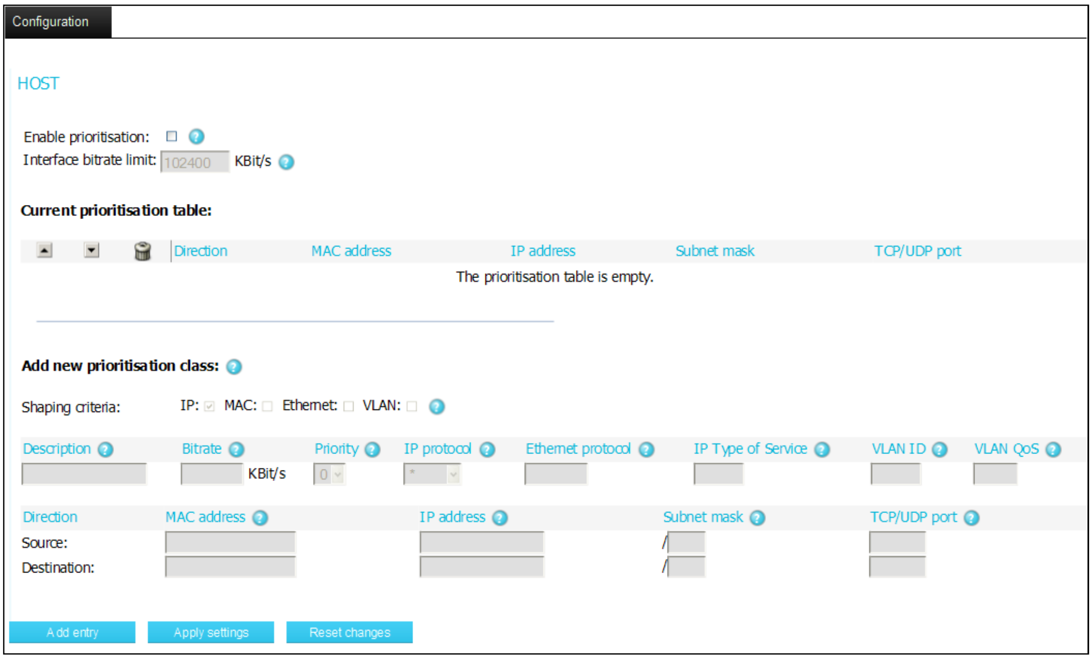
Direction	MAC address	IP address	Subnet mask	TCP/UDP port
Source:			/	
Destination:			/	

Prioritisation is enabled by entering a maximum bit rate as well as at least one prioritisation class. For instance, you'd have to enter a maximum bit rate of 50,000 Kbit/sec if the connected Ethernet infrastructure offers a maximum throughput of 50 Mbit/sec. The criteria for prioritisation classes cannot be combined in all variations. For instance, selecting IP together with VLAN is excluded by the working principle. Prioritisation on WLAN interfaces is using WMM functions. WMM prioritisation is enabled by default and cannot be disabled. The IP Type of Service boxes and VLAN QoS tags are distributed to 4 different Queues according to the WMM specification. If you want to classify packets independent on the IP Type of Service or VLAN QoS tags, you can use the prioritisation page for that. The Priority box is mapped to 4 WMM classes:

0,1 -> WMM Voice
2,3 -> WMM Video
4,5 -> WMM Best Effort
6,7 -> WMM Background

The Lend Bitrate and Dynamic Bitrate functions have been removed in order to simplify operation. (The Lend Bitrate is now disabled by default.)

HOST



HOST

Enable prioritisation: □

Interface bitrate limit: 102400 KBit/s

Current prioritisation table:

Direction	MAC address	IP address	Subnet mask	TCP/UDP port

The prioritisation table is empty.

Add new prioritisation class:

Shaping criteria: IP: ☑ MAC: □ Ethernet: □ VLAN: □

Description	Bitrate	Priority	IP protocol	Ethernet protocol	IP Type of Service	VLAN ID	VLAN QoS
	KBit/s	0	*				

Direction	MAC address	IP address	Subnet mask	TCP/UDP port
Source:			/	
Destination:			/	

Note:

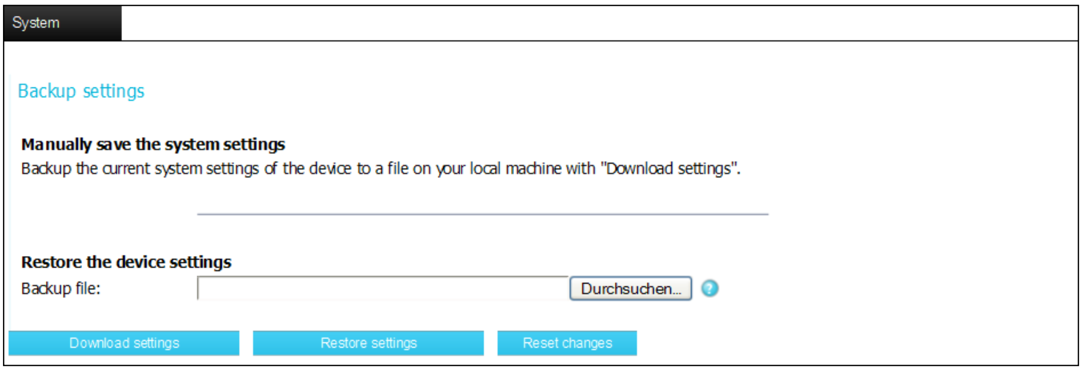
*At least two classes must be created if you want to prioritise a specific data flow. The first class to be created gets the lowest priority value in the **Priority** option box and so specifies the prioritised data traffic. The second class specifies the remaining data flow and should get a value lower than the maximum bit rate. This ensures that the prioritised data flow of the first class will have sufficient bandwidth.*

Note:

*A numerically small value in the **Priority** input box symbolises the shortest delay for Ethernet packets while a high value corresponds to a long delay!*

8.9 SYSTEM

8.9.1 BACKUP SETTINGS



Manually save the system settings
Backup the current system settings of the device to a file on your local machine with "Download settings".

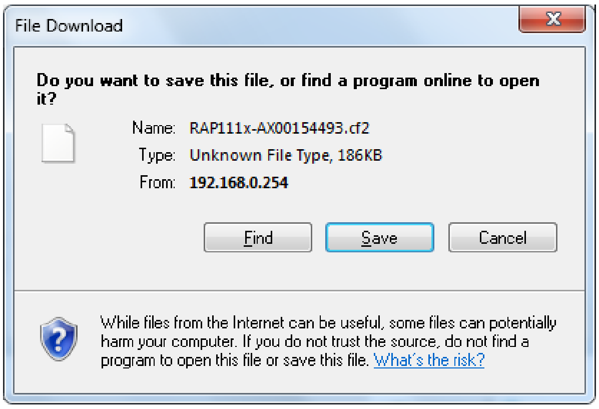
Restore the device settings
Backup file:

The Backup settings menu item allows to backup or to restore the device configuration.

<u>MANUALLY SAVE AND RESTORE THE SYSTEM SETTINGS:</u>

For saving your data in a file, please click on **Download settings**.

➔ ***Note:***
*The file name is predefined and cannot be provided in the web interface. The file name can be changed when the memory location is specified. The file extension *.cf2 must not be changed.*



File Download

Do you want to save this file, or find a program online to open it?

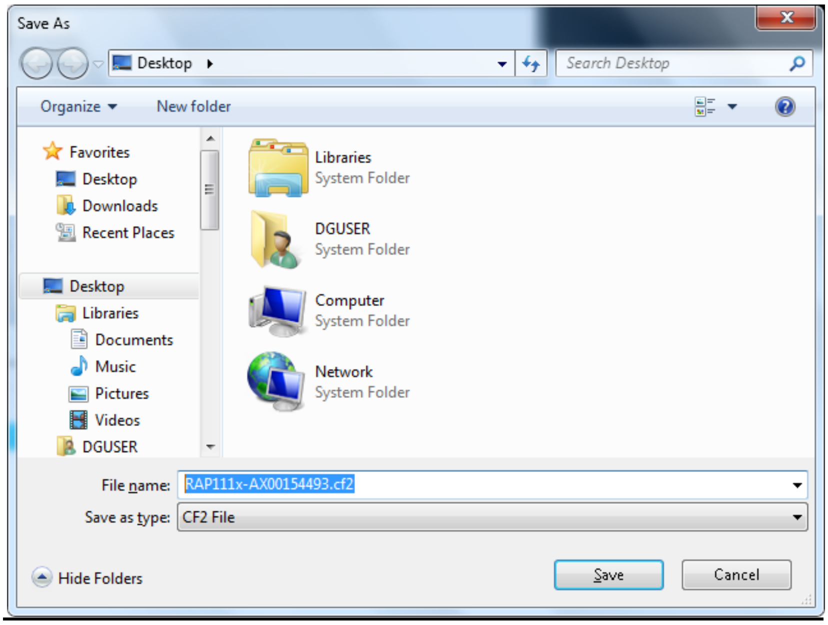
Name: RAP111x-AX00154493.cf2
Type: Unknown File Type, 186KB
From: **192.168.0.254**

While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not find a program to open this file or save this file. What's the risk?

The following popup window will appear. Please select **Download settings.**

It will ask you to save the **settings.cfg** file.

Please click on **Save** and then select a location for saving.
Subsequently click on **Save** one more time.

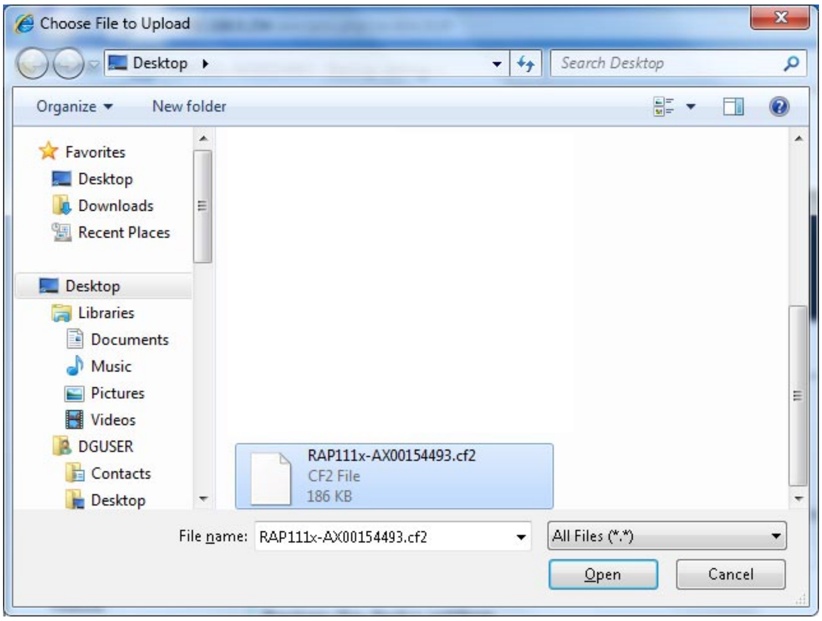


File name: RAP111x-AX00154493.cf2

Save as type: CF2 File

RESTORING THE DEVICE CONFIGURATION:

Click on **Browse** and select the **settings.cfg** file in order to load your backup settings.



File name: RAP111x-AX00154493.cf2

All Files (*.*)

Confirm this action with **Open.** Subsequently click on the **Restore settings** button.
After restart of the device the settings are loaded or restored

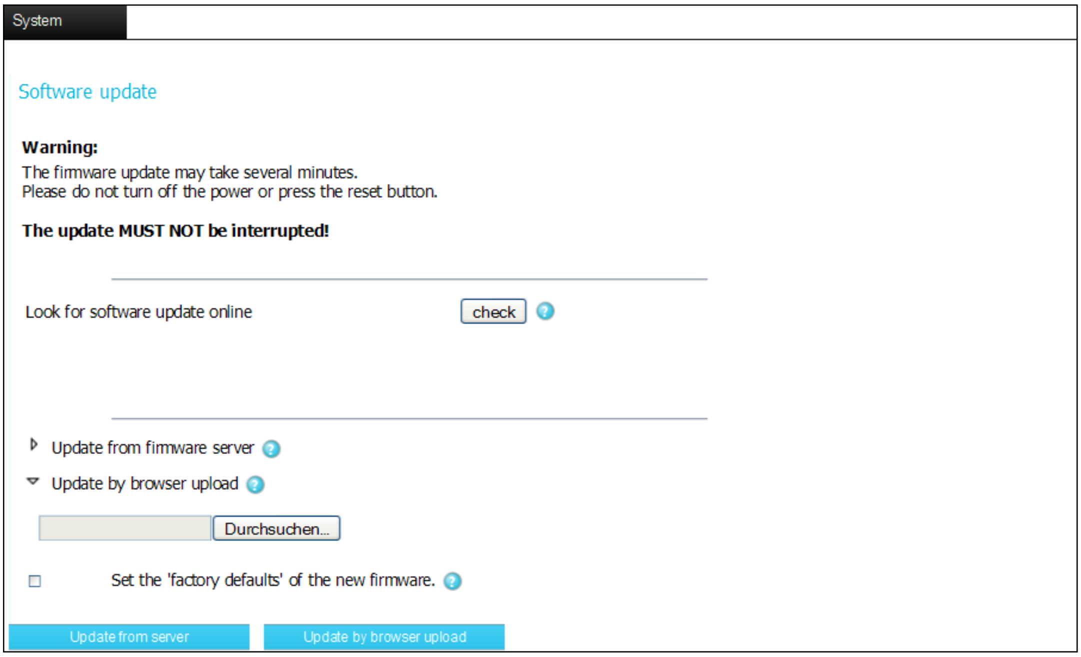
➔

Note:

Setup files of versions 1.x and 2.x with the file extension .dat will no longer be supported in version 3.x.

SOFTWARE UPDATE

The software update menu item allows updating the firmware. The firmware may be updated in three different ways:



Software update

Warning:
The firmware update may take several minutes.
Please do not turn off the power or press the reset button.

The update MUST NOT be interrupted!

Look for software update online

□ Set the 'factory defaults' of the new firmware.

UPDATE VIA ONLINE

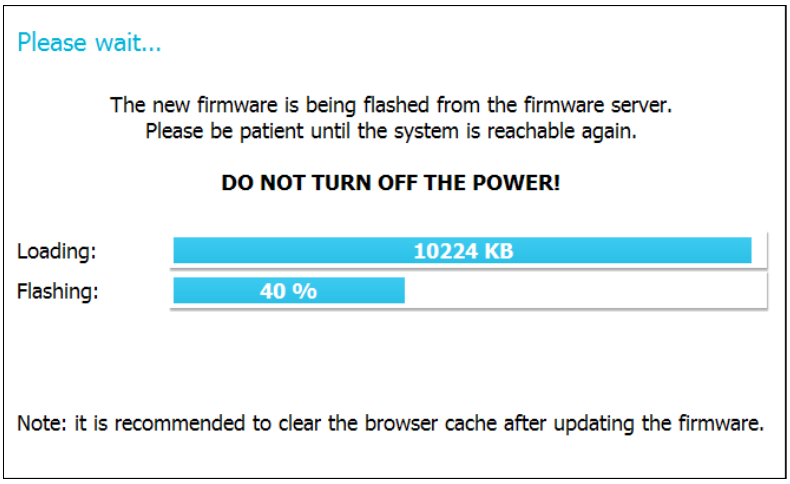
It can be checked via the **Check** button whether an update has been made. To use this function, the ads-tec web site must be available via http.

UPDATE VIA FIRMWARE SERVER

It is possible to update the firmware via an FTP-, TFTP, or HTTP server.

UPDATE VIA BROWSER UPLOAD

If the file was saved locally, the firmware file can be selected directly. Confirm your selection with **Upload via Browser**.


Please wait...

The new firmware is being flashed from the firmware server.
Please be patient until the system is reachable again.

DO NOT TURN OFF THE POWER!

Loading: 10224 KB

Flashing: 40 %

Note: it is recommended to clear the browser cache after updating the firmware.

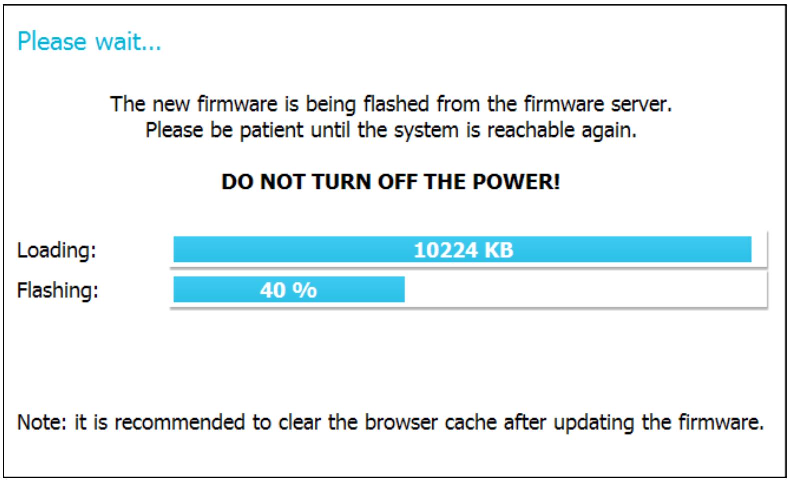
PROCEDURE:

1) Save the firmware file in a local folder of your choice on the PC.
2) Start the desired server service or use a freeware program like tftpd32 to make a firmware update. Further, mind the local device settings on your PC in order to prevent that communication to your device will be blocked.
3) Now state the path of your folder where the new firmware is located under **Browse** and confirm with **OK.**

Note:
*Make sure that the file extension (.bin) of the firmware is indicated, e.g. Ads-tec-RAPxxx-X.X.X-SVN-R10923M.B-7251**.bin***

4) Before you start the update process, it is recommended to take over the factory defaults of the new firmware.
5) Start the update process via **Upload of Firmware Server**

During the firmware update, the following dialogue window appears:



Please wait...

The new firmware is being flashed from the firmware server.
Please be patient until the system is reachable again.

DO NOT TURN OFF THE POWER!

Loading: 10224 KB

Flashing: 40 %

Note: it is recommended to clear the browser cache after updating the firmware.

Once the LED link on the outbound port shows a constant green light and the ACT LED is out, the button **Retry to Connect** can be confirmed.

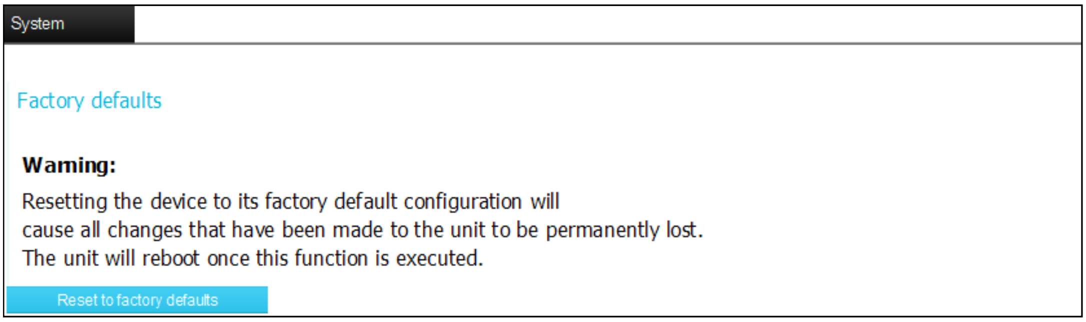
The device tries to access the web interface. If the update has been successful, the software update will be displayed.

Warning:
The power supply must not be interrupted during this process!

8.9.2 FACTORY DEFAULTS

This menu item allows restoring the factory defaults by the software.

The default settings of the device will be loaded by clicking on the **Restore to factory defaults** button.



Factory defaults

Warning:

Resetting the device to its factory default configuration will cause all changes that have been made to the unit to be permanently lost. The unit will reboot once this function is executed.

The following dialogue window will appear while loading the factory defaults.

Using the **try to reconnect** button. If the update has been done successfully, the software update is displayed.

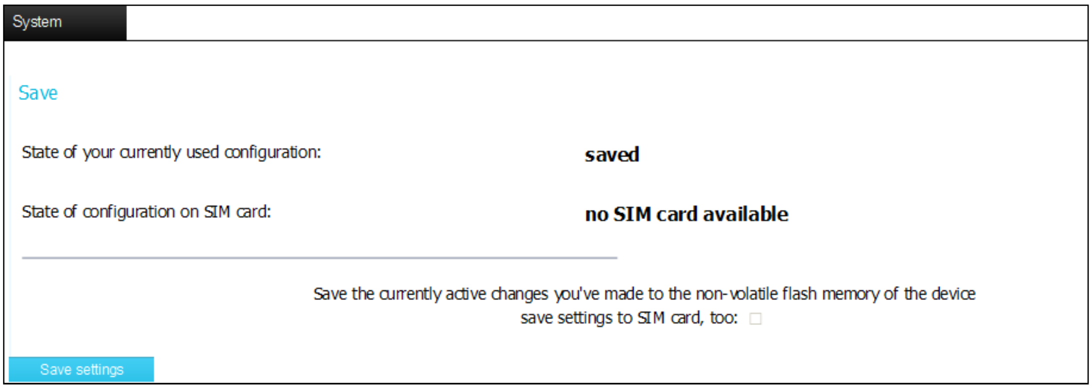
Warning:

All settings will be reset. All created filter rules will be deleted. Should you not be able to get back to the web interface after resetting to factory defaults, adapting the IP address of your PC accordingly might be required.

The following defaults are set:

- IP 192.168.0.254
- User name: **admin**
- Password: **admin**

SAVE



System

Save

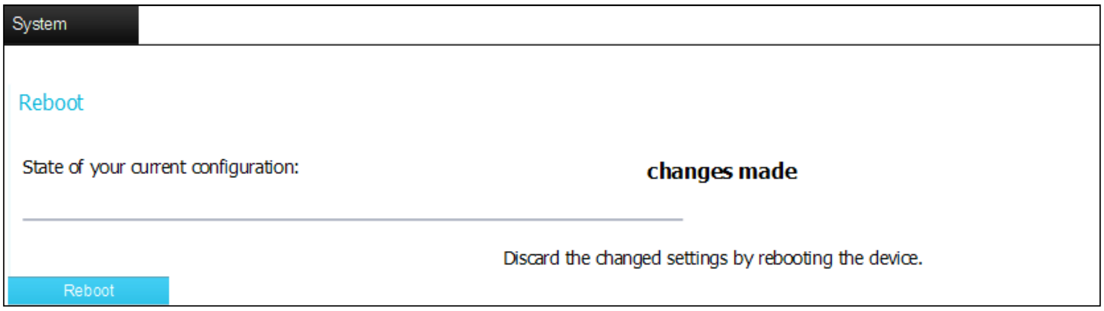
State of your currently used configuration: **saved**

State of configuration on SIM card: **no SIM card available**

Save the currently active changes you've made to the non-volatile flash memory of the device
save settings to SIM card, too: □

The changed settings may be stored in the flash memory by using the Save button. The settings can also be filed on the SIM card.

REBOOT



System

Reboot

State of your current configuration: **changes made**

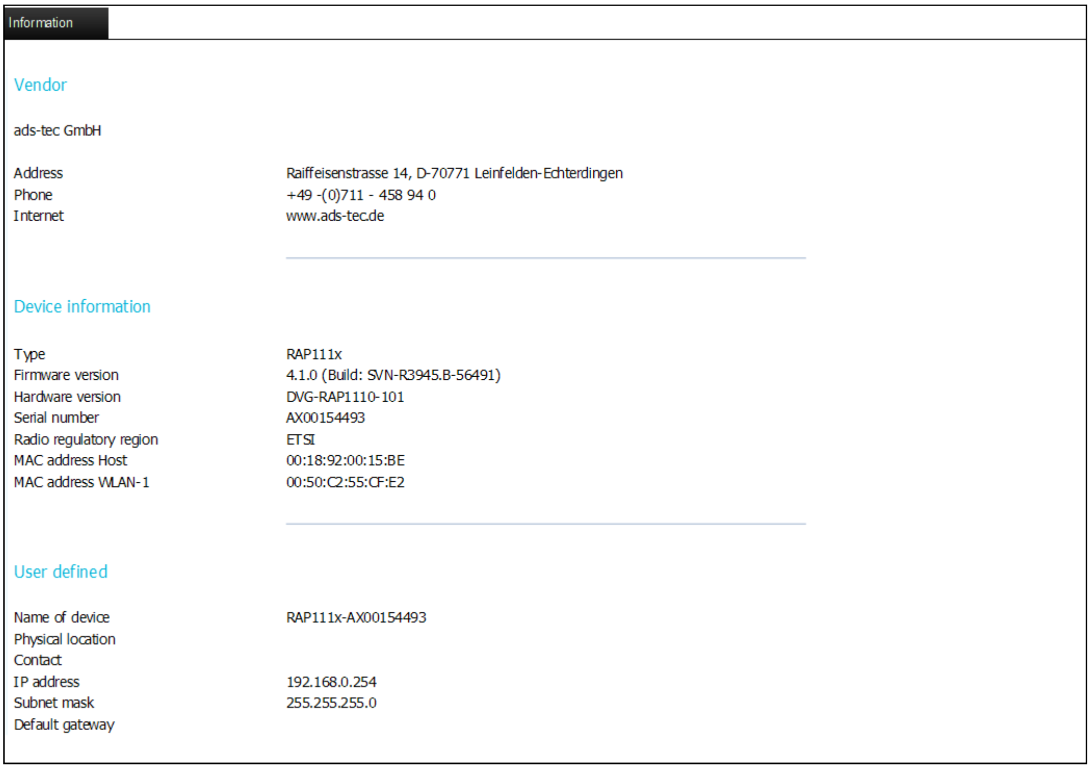
Discard the changed settings by rebooting the device.

The Access Point will be restarted by clicking on the Reboot button.

8.10 Information

8.10.1 General

The **General** menu item shows the basic device information.



Information

Vendor

ads-tec GmbH

Address	Raiffeisenstrasse 14, D-70771 Leinfelden-Echterdingen
Phone	+49 -(0)711 - 458 94 0
Internet	www.ads-tec.de

Device information

Type	RAP111x
Firmware version	4.1.0 (Build: SVN-R3945.B-56491)
Hardware version	DVG-RAP1110-101
Serial number	AX00154493
Radio regulatory region	ETSI
MAC address Host	00:18:92:00:15:BE
MAC address WLAN-1	00:50:C2:55:CF:E2

User defined

Name of device	RAP111x-AX00154493
Physical location	
Contact	
IP address	192.168.0.254
Subnet mask	255.255.255.0
Default gateway	

VENDOR:

This box shows all relevant data about ads-tec GmbH as the manufacturer.

DEVICE INFORMATION:

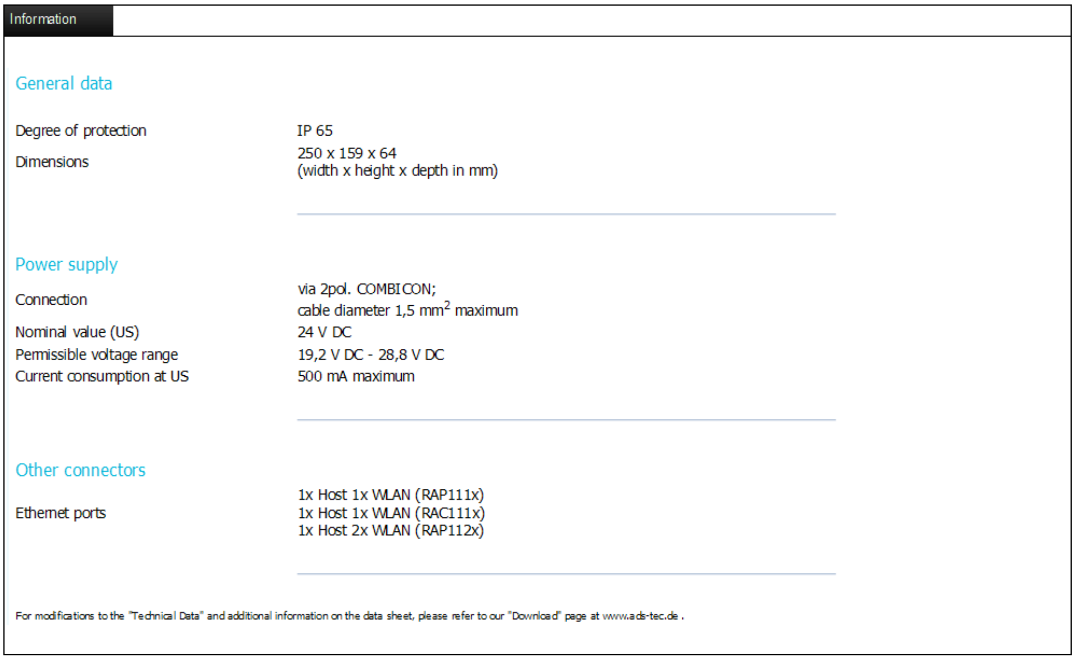
The Device information field shows all relevant device data like Type, Firmware version and Hardware version.

USER DEFINED:

The User defined section displays customer-specific device data.

8.10.2 Technical data

The Technical data screen displays General data for commissioning and the Permissible power supply data for the device.



General data

Degree of protection	IP 65
Dimensions	250 x 159 x 64 (width x height x depth in mm)

Power supply

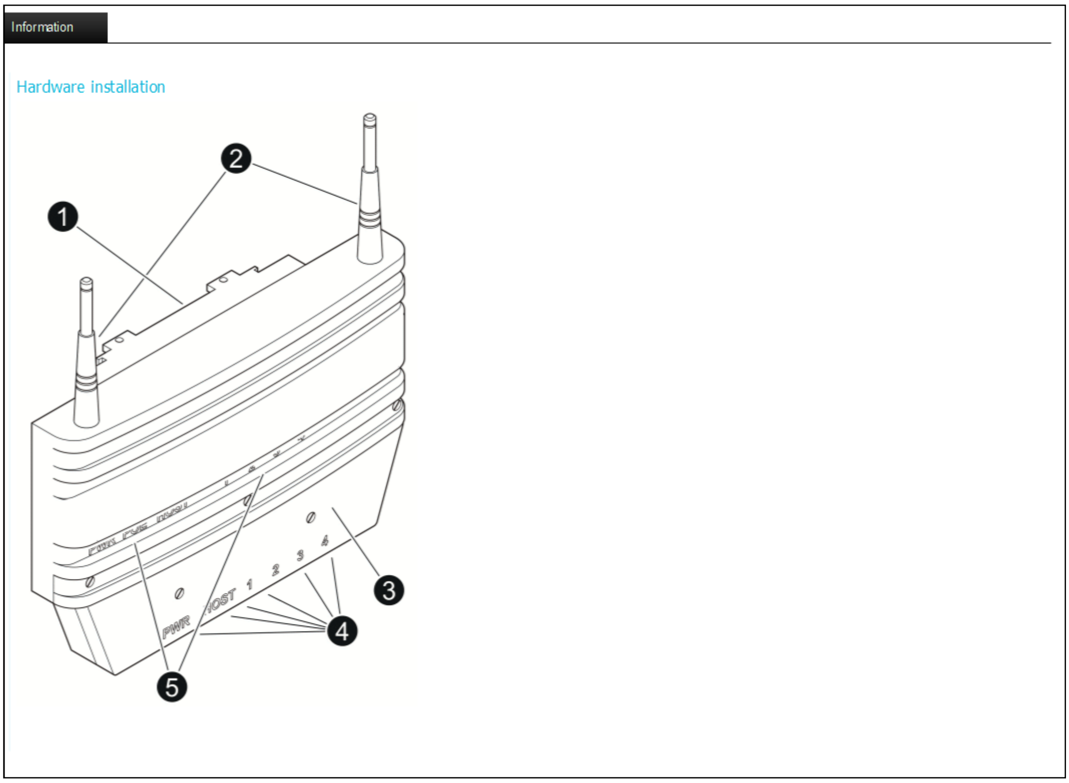
Connection	via 2pol. COMBICON; cable diameter 1,5 mm^2 maximum
Nominal value (US)	24 V DC
Permissible voltage range	19,2 V DC - 28,8 V DC
Current consumption at US	500 mA maximum

Other connectors

Ethernet ports	1x Host 1x WLAN (RAP111x) 1x Host 1x WLAN (RAC111x) 1x Host 2x WLAN (RAP112x)

For modifications to the "Technical Data" and additional information on the data sheet, please refer to our "Download" page at www.ads-tec.de .

8.10.3 Hardware installation



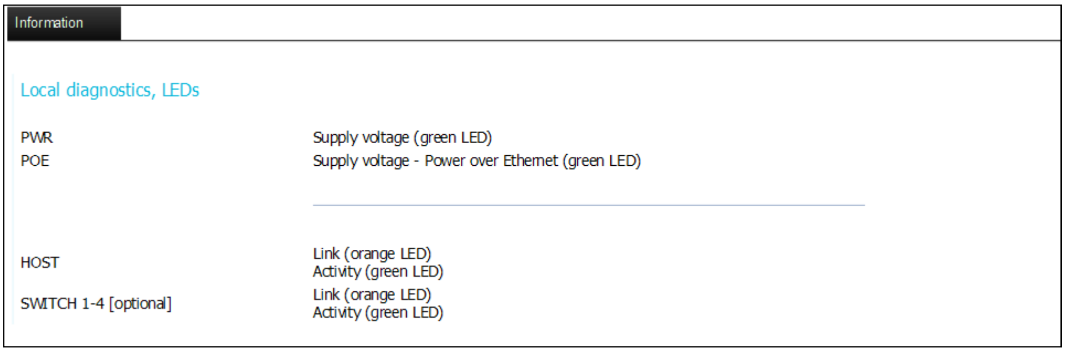
Information

Hardware installation

1) Installation bracket (for mounting the Access Point in the place of installation)
2) Antennas
3) Service compartment
4) Interfaces
5) Status displays

8.10.4 Local diagnostics

The Local diagnostics page shows the LED display functions with different system activities.



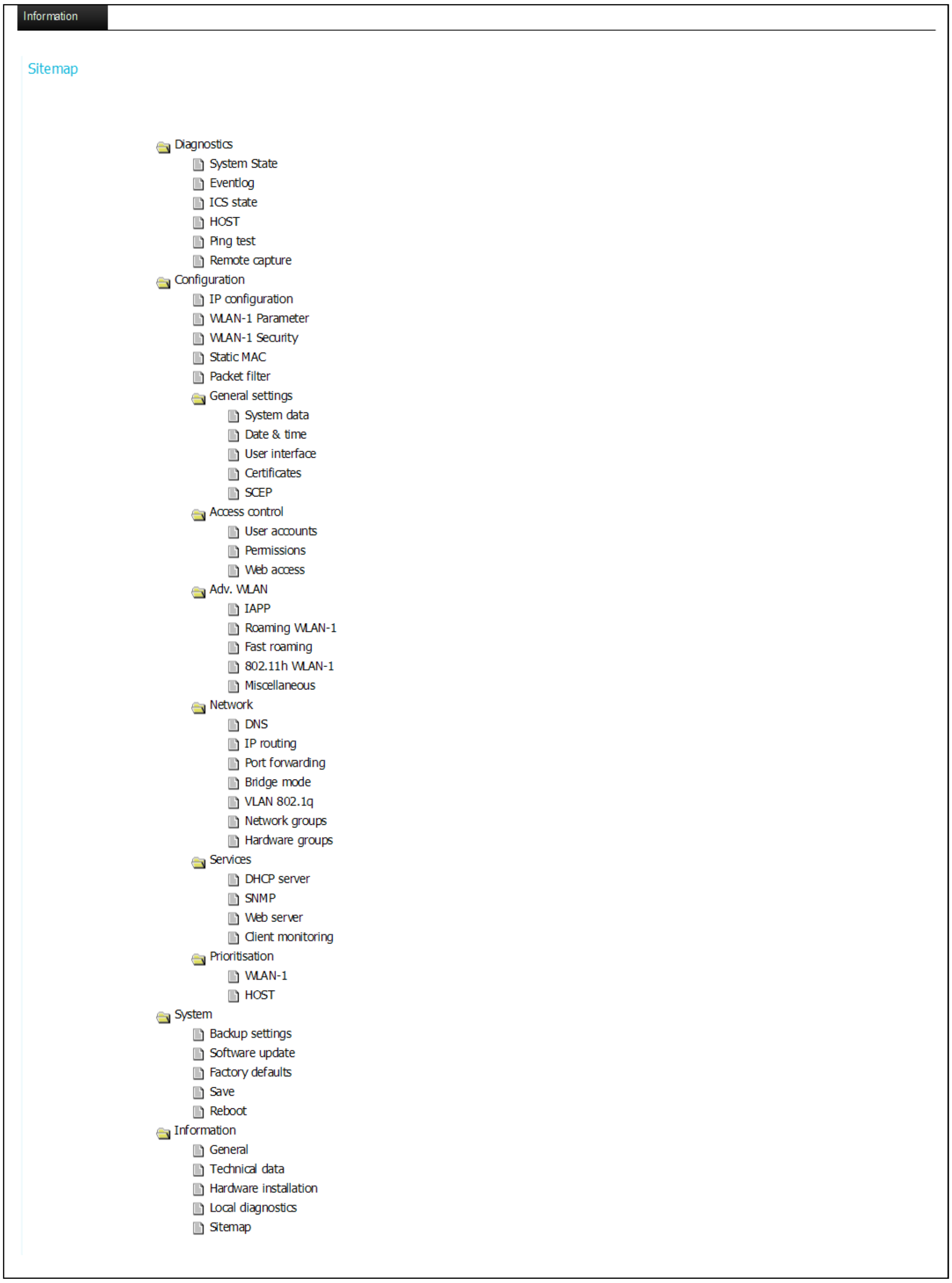
Information

Local diagnostics, LEDs

PWR	Supply voltage (green LED)
POE	Supply voltage - Power over Ethernet (green LED)
HOST	Link (orange LED) Activity (green LED)
SWITCH 1-4 [optional]	Link (orange LED) Activity (green LED)

8.10.5 Sitemap

The Sitemap displays the web interface in a tree structure with all submenus for easy navigation.



Information

Sitemap

- Diagnostics
  - System State
  - Eventlog
  - ICS state
  - HOST
  - Ping test
  - Remote capture
- Configuration
  - IP configuration
  - WLAN-1 Parameter
  - WLAN-1 Security
  - Static MAC
  - Packet filter
  - General settings
    - System data
    - Date & time
    - User interface
    - Certificates
    - SCEP
  - Access control
    - User accounts
    - Permissions
    - Web access
  - Adv. WLAN
    - IAPP
    - Roaming WLAN-1
    - Fast roaming
    - 802.11h WLAN-1
    - Miscellaneous
  - Network
    - DNS
    - IP routing
    - Port forwarding
    - Bridge mode
    - VLAN 802.1q
    - Network groups
    - Hardware groups
  - Services
    - DHCP server
    - SNMP
    - Web server
    - Client monitoring
  - Prioritisation
    - WLAN-1
    - HOST
- System
  - Backup settings
  - Software update
  - Factory defaults
  - Save
  - Reboot
- Information
  - General
  - Technical data
  - Hardware installation
  - Local diagnostics
  - Sitemap

9 Regulatory Approvals

9.1 European Approvals

Note:

Some national regulations may in effect restrict the functionality of the device.

Country	**Tags**	**2.4–2.4835 GHz IEEE 802.11b/g**	**Restrictions**
Belgium	CE (!)	X	Use of 5150-5350 MHz range only allowed indoors TPC and DFS mandatory for 5GHz band
Germany	CE (!)	X	
Finland	CE (!)	X	
Greece	CE (!)	X	
Ireland	CE (!)	X	Indoor use only for 5150-5350 MHz band
Latvia	CE (!)	X	
Luxembourg	CE (!)	X	Indoor use only for 5150-5350 MHz band. Only mobile applications allowed in the 5 GHz band. RLAN/WLAN used for public service requires an *autorisation générale* from the ILR (Institut Luxembourgeois de Regulation)
Netherlands	CE (!)	X	
Poland	CE (!)	X	
Sweden	CE (!)	X	
Slovenia	CE (!)	X	
Czech Republic		X	
Cyprus	CE (!)	X	
Denmark	CE (!)	X	
Estonia	CE (!)	X	
France	CE (!)	X	
United Kingdom	CE (!)	X	
Italy	CE (!)	X	
Lithuania	CE (!)	X	
Malta	CE (!)	X	This equipment may be placed on the local market, subject to

			the condition that a copy of the Declaration of Conformity is submitted to the Authority by the person intending to market the equipment.
Austria	CE (!)	X	
Portugal	CE (!)	X	Information: for this type of applications an integral or dedicated antenna is required. In the frequency ranges of 5250-5350MHz and 5470-5725MHz DFS and TPC are mandatory.If the equipment does not implement DFS, use will be limited to the frequency range 5150-5250MHz, with a limited maximum output power (EIRP) of 0.25mW/25kHz
Slovakia	CE (!)	X	Operation of the wireless LAN equipment is allowed in the frequency band 2400-2483.5MHz, subject to the conditions laid down in the General Authorisation No. VPR-01/2001 (20 dBM EIRP) issued by the Telecommunications Office of the Slovak Republic. In the frequency band 5150-5350MHz, operation of WLAN equipment is allowed subject to the conditions laid down in the General Authorisation No.: VPR-03/2004 (indoors only 5150-5350MHz with DFS: 200mW EIRP with TPC, 120mW EIRP without TPC; 5150-5250MHz without DFS: 120mW EIRP with TPC, 60mW EIRO without TPC). In the frequency band 5470-5725MHz, operation of WLAN equipment is allowed, subject to the conditions laid down in the General Authorisation No.: VPR-07/2004 (1W EIRP, DFS & TCP are required)
Spain	CE (!)	X	
Hungary	CE (!)	X	
Switzerland	CE (!)	X	
Norway	CE (!)	X	
Iceland	CE (!)	X	

9.2 CHANNELLISTS

Land/Certification	Channel	Frequency (MHz)	Restrictions
FCC	1	2412	
	2	2417	
	3	2422	
	4	2427	
	5	2432	
	6	2437	
	7	2442	
	8	2447	
	9	2452	
	10	2457	
	11	2462	
	36	5180	No Outdoor!
	40	5200	No Outdoor!
	44	5220	No Outdoor!
	48	5240	No Outdoor!
	149	5745	
	153	5765	
	157	5785	
	161	5805	
	165	5825	

➔ ***Note:***
The standard ETSI has country-specific settings which must be observed!

Land/Certification	Channel	Frequency (MHz)	Restrictions
ETSI	1	2412	
	2	2417	
	3	2422	
	4	2427	
	5	2432	
	6	2437	
	7	2442	
	8	2447	
	9	2452	
	10	2457	
	11	2462	
	12	2467	
	13	2472	
	36	5180	No Outdoor!
	40	5200	No Outdoor!
	44	5220	No Outdoor!
	48	5240	No Outdoor!
	52	5260	No Outdoor!, DFS
	56	5280	No Outdoor!, DFS
	60	5300	No Outdoor!, DFS
	64	5320	No Outdoor!, DFS
	100	5500	DFS
	104	5520	DFS
	108	5540	DFS
	112	5560	DFS
	116	5580	DFS
	120	5600	DFS
	124	5620	DFS
	128	5640	DFS
	132	5660	DFS
	136	5680	DFS
	140	5700	DFS

Land/Certification	Channel	Frequency (MHz)	Restrictions
Argentinia	1	2412	
	2	2417	
	3	2422	
	4	2427	
	5	2432	
	6	2437	
	7	2442	
	8	2447	
	9	2452	
	10	2457	
	11	2462	
	12	2467	
	13	2472	
	56	5280	DFS
	60	5300	DFS
	64	5320	DFS
	149	5745	
	153	5765	
	157	5785	
	161	5805	
	165	5825	

Land/Certification	Channel	Frequency (MHz)	Restrictions
Egypt	1	2412	
	2	2417	
	3	2422	
	4	2427	
	5	2432	
	6	2437	
	7	2442	
	8	2447	
	9	2452	
	10	2457	
	11	2462	
	12	2467	
	13	2472	
	36	5180	Only 20MHz width!
	40	5200	Only 20MHz width!
	44	5220	Only 20MHz width!
	48	5240	Only 20MHz width!
	52	5260	Only 20MHz width!, DFS
	56	5280	Only 20MHz width!, DFS
	60	5300	Only 20MHz width!, DFS
	64	5320	Only 20MHz width!, DFS

Land/Certification	Channel	Frequency (MHz)	Restrictions
Brasil	1	2412	
	2	2417	
	3	2422	
	4	2427	
	5	2432	
	6	2437	
	7	2442	
	8	2447	
	9	2452	
	10	2457	
	11	2462	
	12	2467	
	13	2472	
	36	5180	
	40	5200	
	44	5220	
	48	5240	
	52	5260	DFS
	56	5280	DFS
	60	5300	DFS
	64	5320	DFS
	100	5500	DFS
	104	5520	DFS
	104	5520	DFS
	108	5540	DFS
	112	5560	DFS
	116	5580	DFS
	120	5600	DFS
	124	5620	DFS
	128	5640	DFS
	132	5660	DFS
	136	5680	DFS
	140	5700	DFS
	149	5745	
	153	5765	

	157	5785	
	161	5805	
	165	5825	

Land/Certification	Channel	Frequency (MHz)	Restrictions
China	1	2412	
	2	2417	
	3	2422	
	4	2427	
	5	2432	
	6	2437	
	7	2442	
	8	2447	
	9	2452	
	10	2457	
	11	2462	
	12	2467	
	13	2472	
	149	5745	
	153	5765	
	157	5785	
	161	5805	
	165	5825	

Land/Certification	Channel	Frequency (MHz)	Restrictions
Russia	1	2412	
	2	2417	
	3	2422	
	4	2427	
	5	2432	
	6	2437	
	7	2442	
	8	2447	
	9	2452	
	10	2457	
	11	2462	
	12	2467	
	13	2472	

Note:
For Japan specific settings in the device, depending on the region, need to be made! For example Region 1 is shown below.

Land/Certification	Channel	Frequency (MHz)	Restrictions
Japan1	1	2412	
	2	2417	
	3	2422	
	4	2427	
	5	2432	
	6	2437	
	7	2442	
	8	2447	
	9	2452	
	10	2457	
	11	2462	
	12	2467	Only 20MHz width!
	13	2472	Only 20MHz width!
	34	5170	
	38	5190	
	42	5210	
	48	5230	

9.4 5 GHZ DFS REGULATION AFTER ETSI EN 301 893 V1.4.1 WITHIN THE EU

INDOOR CHANNELS:

Channel Number [1]	Frequency (MHz)	Max. permissible.radiation with TPC
36	5.180	23 dBm
40	5.200	23 dBm
44	5.220	23 dBm
48	5.240	23 dBm

1) Can be configured manually, DFS is not activated. TPC is always active on ads-tec devices at 5 GHz.

OUTDOOR CHANNELS:

Channel Number [2]	Frequency (MHz)	Max. radiation with TPC	DFS latency[3]
52	5.260	23 dBm	1 min.
56	5.280	23 dBm	1 min
60	5.300	23 dBm	1 min
64	5.320	23 dBm	1 min
100	5.500	30 dBm	1 min
104	5.520	30 dBm	1 min
108	5.540	30 dBm	1 min
112	5.560	30 dBm	1 min
116	5.580	30 dBm	1 min
120	5.600	30 dBm	10 min[5]
124	5.620	30 dBm	10 min[5]
128	5.640	30 dBm	10 min[5]
132	5.660	30 dBm	1 min
136	5.680	30 dBm	1 min
140	5.700	30 dBm	1 min

2) Can only be selected automatically. DFS is always activated. TPC is always active on ads-tec devices at 5 GHz.

3) The DFS latency is actively waiting on power, as well as channel change by radar detection.

4) Access Clients can work without own DFS, if they stay at a permissible radiation of 23dBm. For ads-tec Access Clients, DFS can be activated like the Access Points to a permissible radiation of 30dBm with TPC.

5)5.6 Ghz Weather Radar Channels at ads-tec Access Points have to be activated separately.

9.5 FCC-Approval

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada.

Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Warning:

Changes or modifications made to this equipment not expressly approved by ads-tec GmbH may void the FCC authorization operate this equipment.

Special Note:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20cmbetween the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

9.6 DIRECTIVES

RAP 1120, RAP 1121, RAP 1220,

RAP 1220, RAP 1221,

RAC 1110, RAC 1111, RAC 1510, RAC1511

as manufactured by ads-tec GmbH conform to the regulations of the following EU directives:

99/5/EC

Directive of the European Parliament and of the Council on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

Conformity to the basic requirements of this directive is demonstrated by conformity to the following norms:

EN 60950

Safety of information technology equipment

EN 301489-1

Electromagnetic Compatibility (EMC) standard for radio equipment and services

EN 301489-17

Specific requirements for broadband data transmission systems and for equipment in local high-performance radio networks (HIPERLAN)

EN 300328

Electromagnetic compatibility and Radio spectrum Matters (ERM), Wideband Transmission systems

EN 301893

Broadband Radio Access Networks (BRAN) - 5 GHz high performance RLAN

EN 50371

Generic Standard to Demonstrate the Compliance of Low Power Electronic and Electrical Apparatus with the Basic Restrictions Related to Human Exposure to Electromagnetic Fields (10 MHz - 300 GHz)

1999/519/EC

European Council recommendation on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

Any devices connected to the system need to fulfil all applicable safety regulations. In accordance with the above EU directives, a copy of the EU declaration of conformity is kept at the following address at the disposal of the competent authority:

ads-tec GmbH Raiffeisenstraße 14

70771 Leinfelden-Echterdingen / Oberaichen

This declaration confirms conformity with the aforementioned directives and guidelines. It does not constitute a warranty of performance.

10 Technical Details

10.1 RAP and RAC versions

		RAP – Rugged Access Point											
		RAP1000 series											
		RAP 1110	RAP 1111	RAP 1210	RAP 1211	RAP 1120	RAP 1121	RAP 1220	RAP 1221	RAP 1510	RAP 1511	RAP 1520	RAP 1521
Radio modules	1 WLAN module	x	x	x	x					x	x		
	2 WLAN module s					x	x	x	x			x	x
Ports	1x Cu-RJ45 port	x	x			x	x			x	x	x	x
	4x Cu-RJ45 port (switch)									x	x	x	x
	1x fibreoptic Ethernet port			x	x			x	x				
Power supply	24 V DC	x	x	x	x	x	x	x	x	x	x	x	x
	AC integrated 110/230 V		x		x		x		x		x		x
	Redundant energy supply	x	x		x	x	x		x	x	x	x	x
Client mode	RAP incl. client mode	x	x	x	x	x	x	x	x	x	x	x	x
	Seamless Roaming Client*					x	x	x	x			x	x

		RAC – Rugged Access Client					
		RAC1000 series				RAC2000 series	
		RAC 1120	RAC 1121	RAC 1220	RAC 1221	RAC 2110	RAC 2120
Radio modules	1 WLAN module					x	
	2 WLAN modules	x	x	x	x		x
Ports	1x Cu-RJ45 port	x	x			x	x
	4x Cu-RJ45 port (switch)						
	1x fibreoptic Ethernet port			x	x		
Power supply	24 V DC	x	x	x	x	x**	x**
	AC integrated 110/230 V		x		x		
	Redundant energy supply	x	x		x		
Client mode	RAP incl. client mode						
	Seamless Roaming Client*	x	x	x	x		x

* Seamless Roaming Clients: From access point to access point without any packet loss or interruption of data transmission
**12 – 24V

10.2 Ethernet Data Transmission

HOST Ethernet plug	RJ45 or optical fibre (MTRJ)
Transmission rate Ethernet	10/100 Mbit/s
Optional Switch	4x RJ45 with 10/100 Mbit/s

10.3 Radio Properties

Frequency range	2.412 to 2.483 GHz
	5.15 to 5.34 GHz
	5.47 to 5.725 GHz
Radio channels	13 for 802.11b/g
	19 for 802.11a
Transmission bandwidth	802.11b (11 Mbit/s)
	802.11g (54 Mbit/s)
	802.11a (54 Mbit/s)
	802.11h (54 Mbit/s)
Max. transmission power	20 dBM EIRP, 17dBm with R-SMA connector
Modulation	802.11b: DSSS
	802.11g: OFDM
	802.11a/h: OFDM
Impedance	50 Ohm
Polarity	Vertical / Horizontal
Antennas	2x R-SMA connectors per radio module

10.4 Power Supply

Voltage	24 V DC
	110/230 V AC
Power input	max. 500mA

10.5 Configuration

Software	Web-based Interface (German/English) via HTTP or HTTPS, password-protected

10.6 General Data

Exterior dim. w/o antenna	250 mm x 160 mm x 65 mm (W x H x D)
Exterior dim. w/ 2 antennas	425 mm x 335 mm x 65 mm (W x H x D)
Exterior dim. w/ 4 antennas	600 mm x 335 mm x 65 mm (W x H x D)
Weight	approx. 1 kg
Protection Class	IP65

11 Service and Support

ads-tec and appointed partner companies offer you comprehensive maintenance and support services, ensuring quick and competent support should you have any questions or concerns with regard to ads-tec products and equipment.

ads-tec products may also be provided and installed by partner companies. Such devices may have customised configurations. Should any questions arise with regard to such specific settings and software installations, please contact the system supplier in question as ads-tec will not be able to reply to such questions.

ads-tec does not provide support services for any device or unit that was not bought directly from ads-tec. In any such case, maintenance and support is provided solely by the partner company that supplied the device or unit.

11.1 ads-tec Support

The ads-tec support team is available for inquiries by direct customers between 8:30am and 5:00pm, Monday to Friday. The support team can be reached via phone, fax or email.

Phone:	+49 711 45894-500
Fax:	+49 711 45894-990
E-Mail:	mailbox@ads-tec.de

11.2 Company Address

ads-tec
Automation Daten- und Systemtechnik GmbH
Raiffeisenstraße 14
70771 Leinfelden-Echterdingen
Germany

Phone:	+49 711 45894-0
Fax:	+49 711 45894-990
E-Mail:	mailbox@ads-tec.de
Home:	www.ads-tec.de

12 Examples of Use

12.1 Prioritization

General

Nowadays a great many different types of data are transmitted via communication networks and the data volumes also constantly increase. Prioritization allows to allocate varying high transmission rates to the different types of data and thus to avoid that downloading has a negative impact on a VoIP connection. Compared to wired networks, WLAN is restricted by a smaller data throughput. Therefore prioritization is particularly advisable here.

Upgrades from 802.11e

In addition to a user-controlled prioritization, the RAP/RAC devices from ads-tec also make the QoS upgrades of 802.11e standard. These upgrades are permanently active. The 802.11e standard defines four classes out which the Voice standard has top priority:

- Best Effort
- Background
- Video
- Voice

For the purpose of classification, the Type of Service box is evaluated according to the following table:

IP ToS	802.11e Class
0x20	Background
0x40	
0x80	Video
0xA0	
0xC0	Voice
0xE0	
0x88	
0xB8	
Others	Best Effort

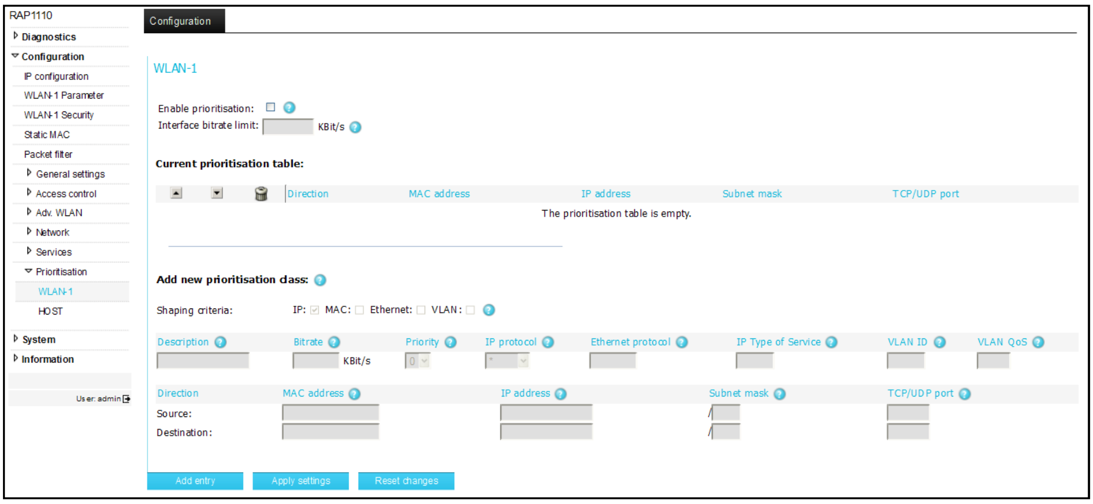
If now various data connections are active at the same time, a VoIP connection can preferably be transmitted via the Type of Service box (e.g.: on 0xC0).

➔ **Note:**
The 802.11e Prioritization is applicable to outbound packets only.

The 802.11e upgrades are always active and are thus also available without configuration. The required settings for a user-controlled prioritization will be explained below.

CONFIGURATION

All interfaces can be configured separately under menu item „**Configuration → Prioritization**".



Enable prioritisation: □

Interface bitrate limit: KBit/s

Current prioritisation table:

Direction	MAC address	IP address	Subnet mask	TCP/UDP port

The prioritisation table is empty.

Add new prioritisation class:

Shaping criteria: IP: ☑ MAC: □ Ethernet: □ VLAN: □

Description | Bitrate KBit/s | Priority 0 | IP protocol * | Ethernet protocol | IP Type of Service | VLAN ID | VLAN QoS

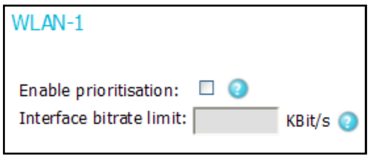
Direction | MAC address | IP address | Subnet mask | TCP/UDP port

Source: /

Destination: /

ACTIVATION

Prioritization for an interface is started by ticking „Activate prioritization" and defining a maximum bit rate. In this case, i.e. if classes have not yet been defined, the device transmits all types of data up to the selected bit rate and rejects the excessive data.



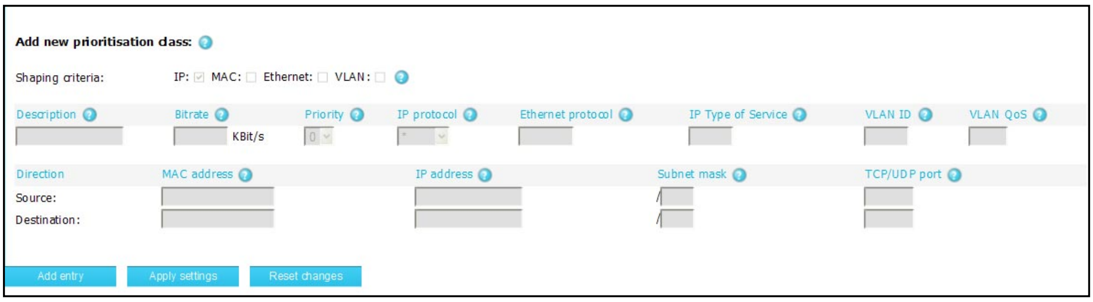
Enable prioritisation: □

Interface bitrate limit: KBit/s

> ***Note:***
>
> *Prioritization is applicable to outbound packets only.*

ADDING CLASSES

As already mentioned before, real prioritization is divided into classes. In this connection the different types of data are allocated to one or more classes. The individual classes are saved in a table. They can be deleted or their position can be changed by clicking the known buttons.



Add new prioritisation class:

Shaping criteria: IP: ☑ MAC: □ Ethernet: □ VLAN: □

Description | Bitrate KBit/s | Priority 0 | IP protocol * | Ethernet protocol | IP Type of Service | VLAN ID | VLAN QoS

Direction | MAC address | IP address | Subnet mask | TCP/UDP port

Source: /

Destination: /

> ***Note:***
>
> *The position is of major importance for later prioritization since the individual classes are sequentially processed for each data packet and the class is used at the first hit.*

ADDING CLASSES

A class contains criteria according to which the data packets are analysed and classified:

- IP: for IP packets
- Ethernet: for Ethernet frames
- VLAN: for VLAN packets

In addition to these three criteria, the MAC addresses can also be included as criterion.

Now it is possible to further differentiate by means of the following criteria:

Internet protocol	Transport Protocol included in the IP packet: TCP/UDP/ICMP or * for all.
Ethernet protocol	Protocol number specified in hexadecimal. Values between 0x0600 – 0xFFFF are admissible.
IP Type of Service	The Internet Protocol specifies a prioritization in this field which can be evaluated here and used as a criterion.
VLAN ID	Clear ID-number of a VLAN. If 0 is chosen, the VLAN QoS is evaluated.
VLAN QoS	Values from 0 to 7 indicating prioritization. Is only evaluated if VLAN ID = 0.
MAC addresses	Target and source MAC address.
IP addresses	Target and source IP address with net mask.
Port number	Port number, if TCP or UDP was chosen.

Then the name, bit rate and priority have to be defined for each class. In this connection, make sure that the sum of all class bit rates does not exceed the interface bit rate. For priority, values between 0 (high) and 7 (low) are given.

If no class can be found for a data type, priority 7 is automatically allocated and the remaining bit rate is used.

➔

Note:

If all criteria fields are left empty and this rule is added at the end of the table, the behaviour which is normally not applied to non-classified data types can be adapted.

EXAMPLE

In the above example the maximum bit rate of the interface is set at 5Mbit/s. This bit rate is shared by three classes. The first class with a low priority and a bit rate of only 0.5Mbit/s describes normal HTTP connections. The second class is reserved for VoIP connections with 3.5Mbit/s and highest priority. The third class is the Default class (not configured) covering the residual data traffic to which the remaining 1Mbit/s are allocated.

DEACTIVATING PRIORITIZATION

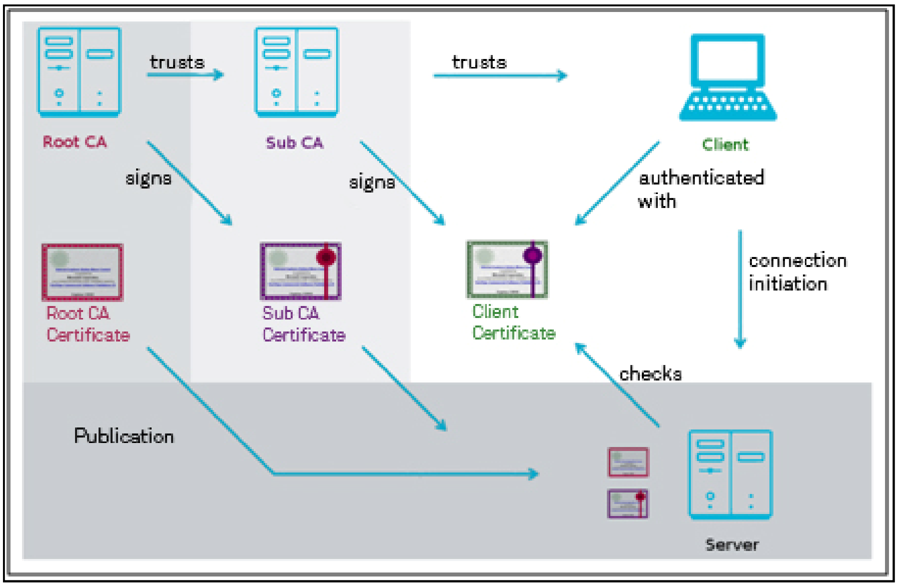
All interfaces can be deactivated under menu item „**Configuration → Prioritization**“. For this purpose remove the tick „**Activate prioritization**“.

12.2 Certificates

General

Certificates are for authentication of a computer or user and for encryption of a connection (e.g. Open VPN, IPsec, web page). A certificate has first to be signed by a Certificate Authority (CA) in order to be used for this purpose. For authentication the certificate of the receiver is checked with the CA certificate. If the signature is valid and the CA is trustworthy, then the receiver is deemed to be authenticated. A CA certificate is called Root Certificate if it is the basis of authentication and has not been signed by another authority (self-signed certificate). Such a Root CA can be used to sign subordinate CA certificates. In this way a Chain of Trust is created the basis of which is the Root Certificate.

For verification of a certificate signed by a CA which is no Root CA, the certificates of all superordinate CAs must be available.



Example: A Root CA (ads-tec Root CA) signs a subordinate sub CA (ads-tec ST-CA), which in turn signs a Client Certificate for an OpenVPN connection. For verification of the Client Certificate, the certificate of both „ads-tec ST CA" as well as „ads-tec Root CA" must be available on the system.

ads-tec devices from the IT Infrastructure sector support such multi-step CA hierarchies. If all CA certificates of the hierarchy are available, the certificate-based services (e.g. OpenVPN, IPsec, radius) always verify the complete path of hierarchy. If a CA certificate of the chain proves to be invalid, this also applies to all subordinate certificates.

To prevent misuse of lost or compromising certificates, a Certificate Revocation List (CRL) can be issued by any CA. Certificates included in this list are even invalid if signed correctly.

➔ ***Note:***
This type of authentication is applied to verify that a certificate has been created (and/or signed) by a certain Certificate Authority. Hence the reliability is based on the trust in the Certificate Authority, i.e. the trust that this authority has created (and/or signed) the certificate just for the stated purpose (e.g. for authentication of a specific web page).

CREATING CERTIFICATES WITH OPENSSL

CA certificates and thus signed certificates can be created with OpenSSL via the prompt command. OpenSSL for Windows is downloaded from: http://www.openssl.org/related/binaries.html. Instructions for the example are given under:

- http://www.online-tutorials.net/security/openvpn-tutorial/tutorials-t-69-209.html
- http://www.madboa.com/geek/openssl/

➔ ***Note:***
The sample certificates are for demonstration purposes and must definitely not be used for true authentication.

The certificates are valid from the time of issue, i.e. the date indicated on the issuing computer must be correct.

A certificate infrastructure can also be created by means of the Microsoft Windows Servers 2000/2003 PKI. One point of entry is: http://www.microsoft.com/pki.

Identity information (country, name, etc.) must be given to disambiguate the various certificates. Two various certificates shall not provide exactly the same information. At least one box must be different (e.g. the common name).

Certificate management with OpenSSL by operating the Windows command line is a bit troublesome; that's why we recommend the use of graphic front-ends for smaller-scale applications. For this purpose the use of free software „XCA" will be explained in the next chapter.

CREATING CERTIFICATES WITH XCA

Key Management with XCA for OpenVPN

This chapter explains how to create and use CA, Server and Client Certificates by means of XCA, especially for the application with OpenVPN.

Introduction:

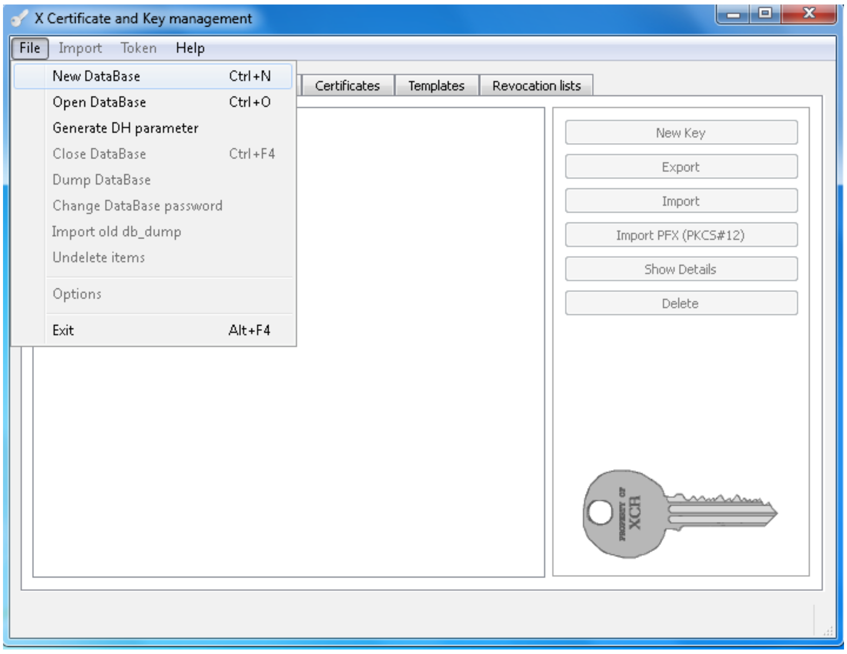
XCA is a very useful and versatile tool of Certificate Management. In the beginning the diversity of possibilities may be confusing if you want to create „just" a few certificates for OpenVPN. Basis of this document is the XCA version 0.9.0.

Helpful links:

Further hints and notes are given under: http://XCA.sourceforge.net/

The update XCA version can be downloaded under the following link: http://sourceforge.net/projects/XCA/

Please install the program and make the basic standard settings. Setup a new data base after the first program start:

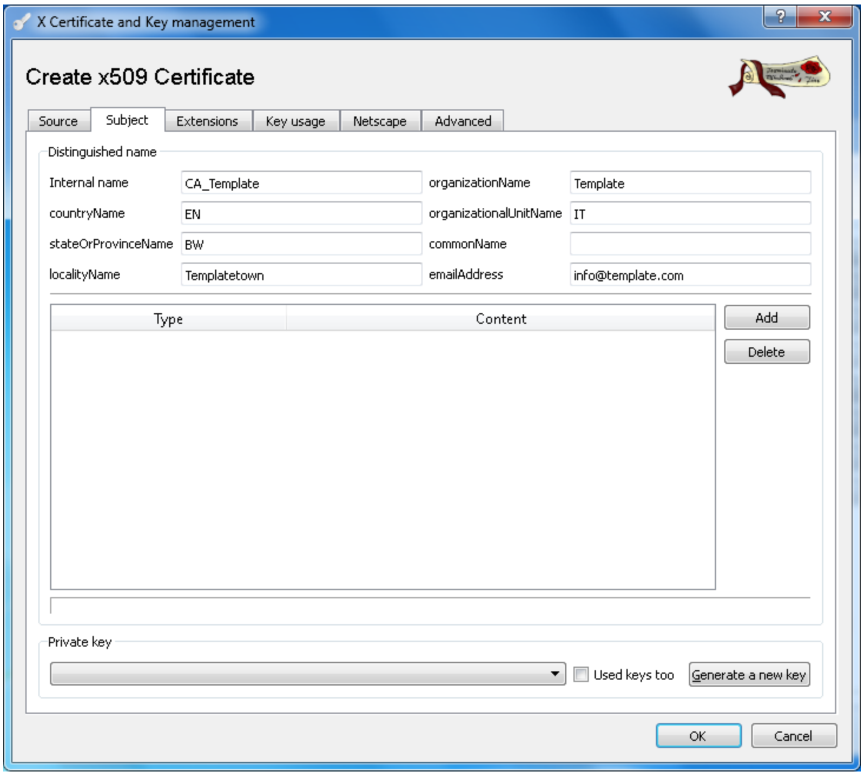


Use a logic name such as "**CA_Project Name**". Encrypt this data base with a password: Keep your password in a safe place.

For easier operation of the XCA right from the start, you should first of all make templates for the three standard steps.

Click the tab "**Template**" and choose "**New Template**" and then "**CA**" in the next appearing pop-up window.

Enter "**CA_Temlate**" as „**Internal Name**" for the new CA template. Complete all boxes, except the box "**Common Name**". This must remain empty.


X Certificate and Key management

Create x509 Certificate

Distinguished name

Internal name	CA_Template	organizationName	Template
countryName	EN	organizationalUnitName	IT
stateOrProvinceName	BW	commonName	
localityName	Templatetown	emailAddress	info@template.com

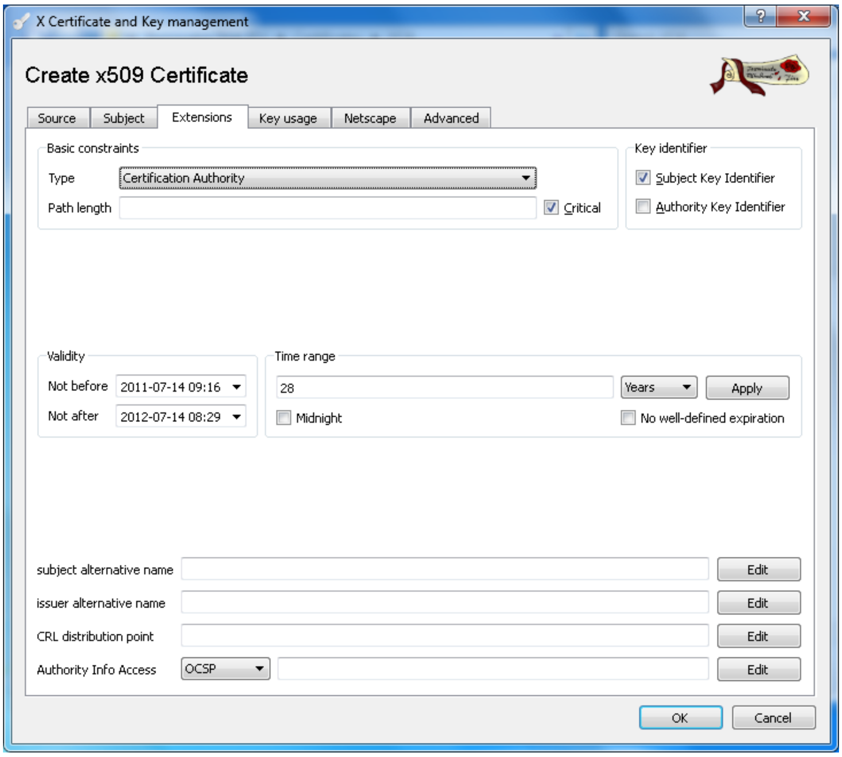
Type	Content

Private key

□ Used keys too

The standard validity of the certificates is entered under the next tab “**Extensions**”.

Generally, it is recommended to choose a longer period of time.


X Certificate and Key management

Create x509 Certificate

Basic constraints

Type: Certification Authority

Path length:

☑ Critical

Key identifier

☑ Subject Key Identifier

□ Authority Key Identifier

Validity

Not before: 2011-07-14 09:16

Not after: 2012-07-14 08:29

Time range

28 Years

□ Midnight

□ No well-defined expiration

subject alternative name

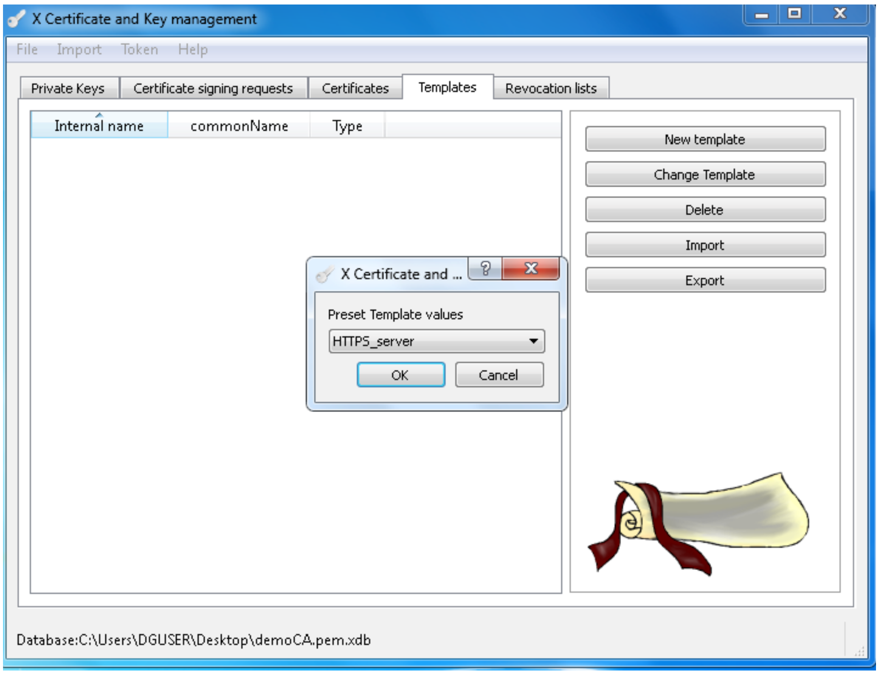
issuer alternative name

CRL distribution point

Authority Info Access: OCSP

If you want to click on „**OK**“ now, you should receive the message that your CA template has been successfully created.

Repeat all previous steps, but choose „**HTTPS_server**‟ as template now.



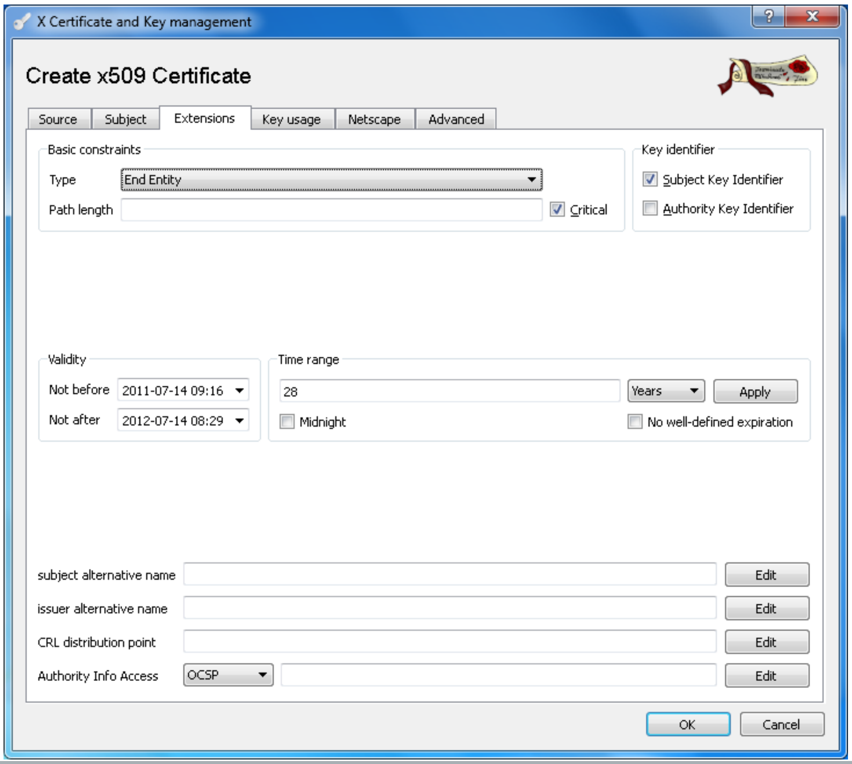
Preset Template values: HTTPS_server

Database:C:\Users\DGUSER\Desktop\demoCA.pem.xdb

The "**OpenVPN_Server_Template**‟ is recommended as “**Internal Name**”. All other data shall be the same as for the CA template.

Special attention is to be paid to the validity of the certificate. It may probably make sense to renew certificates after a certain period of time and therefore to choose a shorter period of validity.

Otherwise, a longer period should be chosen:



Type: End Entity

Path length: ☑ Critical

☑ Subject Key Identifier

☐ Authority Key Identifier

Not before: 2011-07-14 09:16

Not after: 2012-07-14 08:29

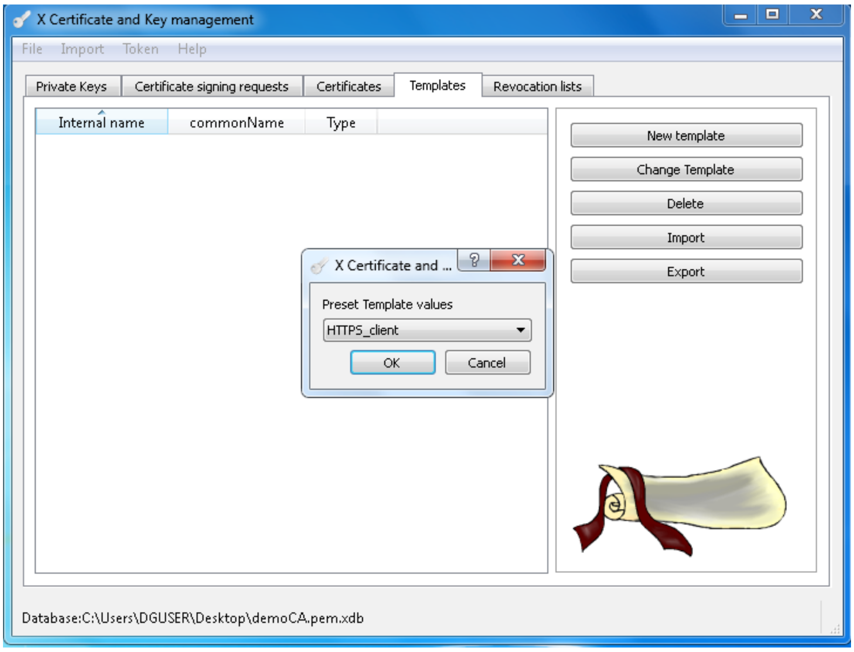
Time range: 28 Years

☐ Midnight

☐ No well-defined expiration

Authority Info Access: OCSP

The third and last template to be created is “**HTTPS_Client**”.

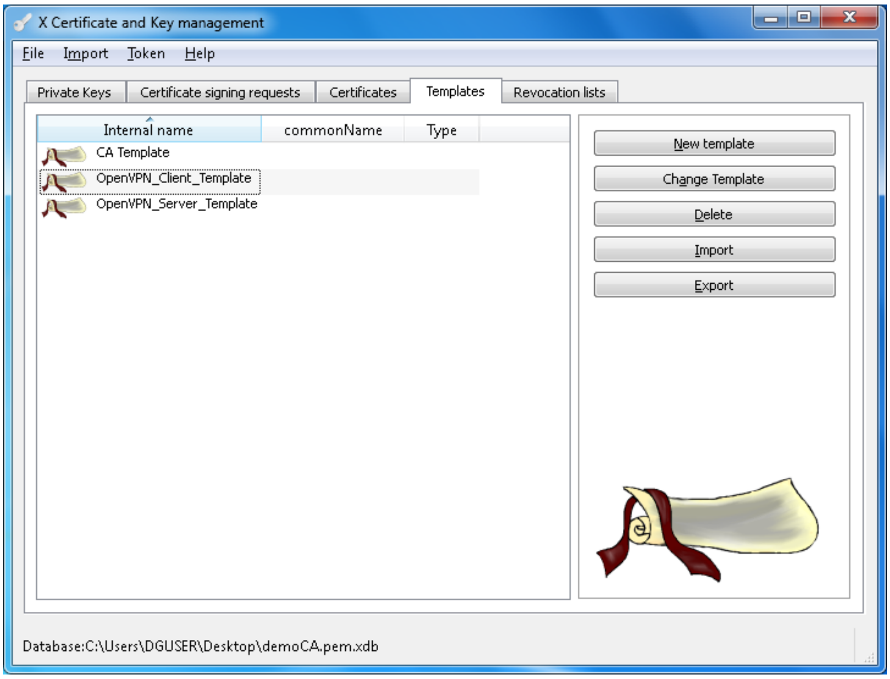


Preset Template values: HTTPS_client

Database:C:\Users\DGUSER\Desktop\demoCA.pem.xdb

„**OpenVPN_Client_Template**“ is, for instance, recommended as „**Internal Name**“. Otherwise, you may choose the same date as for the Server and CA templates.

Now you should have created the following three templates:



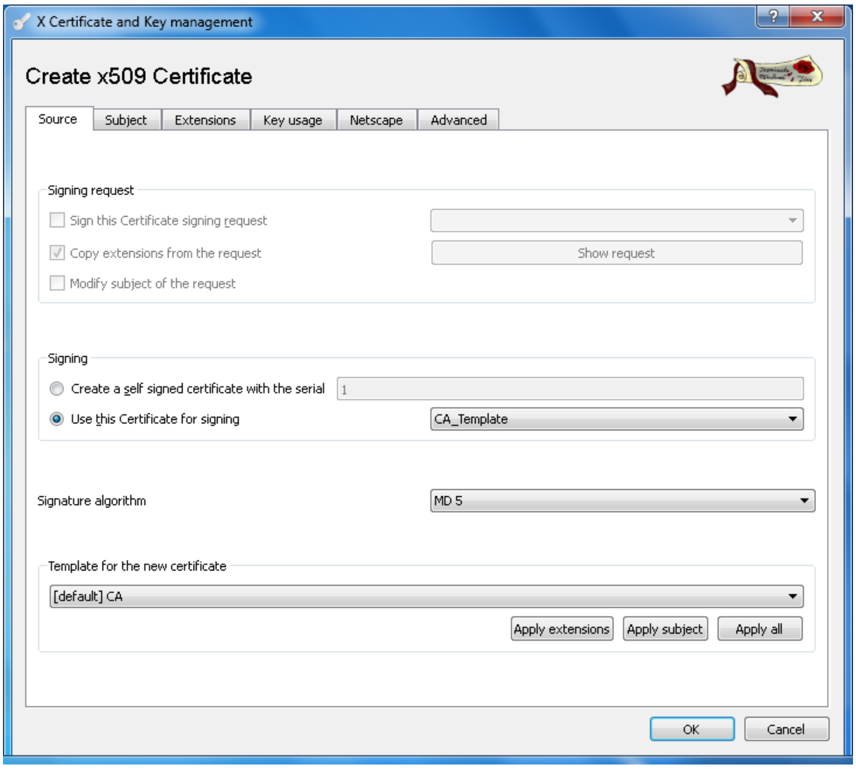
Internal name	commonName	Type
CA Template		
OpenVPN_Client_Template		
OpenVPN_Server_Template		

Database:C:\Users\DGUSER\Desktop\demoCA.pem.xdb

Creating a CA

Now you can start creating the required files. For creating a CA you may now use the previously created CA template. Click on the tab „**Certificates**“ and then „**New Certificate**“. In the new window under the tab „**Origin**“, you may now choose your CA template („CA_Template“).

Change to "**MD5**" under "**Signature Algorithm**". **Don't forget to confirm your settings by „Apply all".**


X Certificate and Key management

Create x509 Certificate

Signing request

□ Sign this Certificate signing request

☑ Copy extensions from the request

□ Modify subject of the request

Signing

○ Create a self signed certificate with the serial: 1

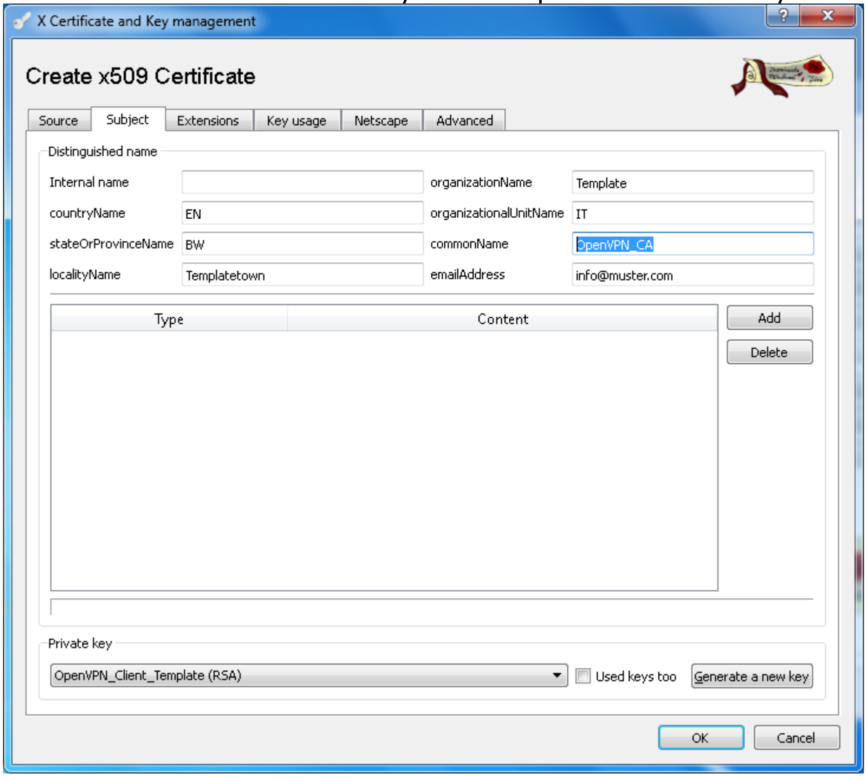
● Use this Certificate for signing: CA_Template

Signature algorithm: MD 5

Template for the new certificate: [default] CA

Enter a name, e.g. OpenVPN_CA, in the next tab "**Holder**" under "**commonName**".

All other boxes should already be completed automatically from your template.


X Certificate and Key management

Create x509 Certificate

Distinguished name

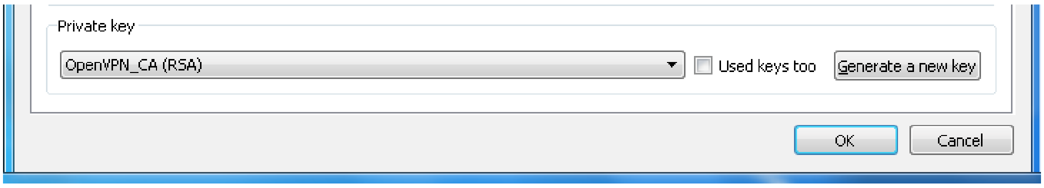
Internal name		organizationName	Template
countryName	EN	organizationalUnitName	IT
stateOrProvinceName	BW	commonName	OpenVPN_CA
localityName	Templatetown	emailAddress	info@muster.com

Type	Content

Private key: OpenVPN_Client_Template (RSA)

□ Used keys too

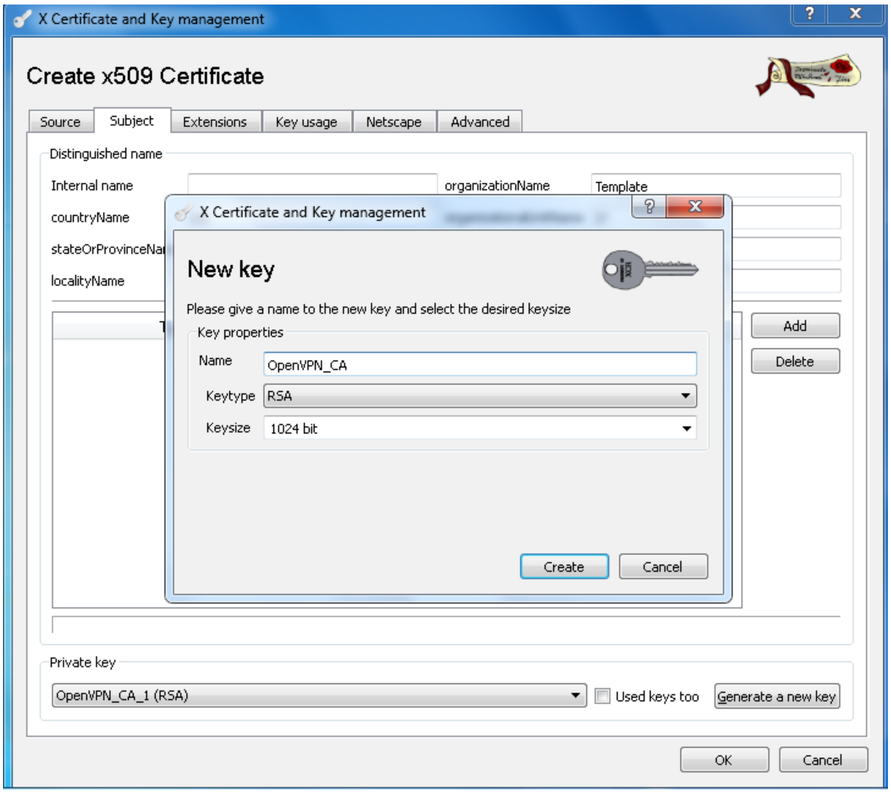
Then click on "**Creating a new key**". The best is to use the same name here as under „**commonName**". In our example this is: „**OpenVPN_CA**".


Private key

OpenVPN_CA (RSA)

Choose a key length depending on your safety need. In doing so, however mind that an extreme key length slows down the VPN speed and increases the loading time of the system and the device.

Generally, „**2048 bit**" is a good value that also offers a high standard of safety.



New key

Please give a name to the new key and select the desired keysize

Key properties

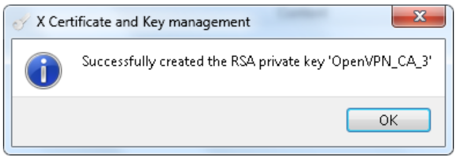
Name: OpenVPN_CA

Keytype: RSA

Keysize: 1024 bit

Private key: OpenVPN_CA_1 (RSA)

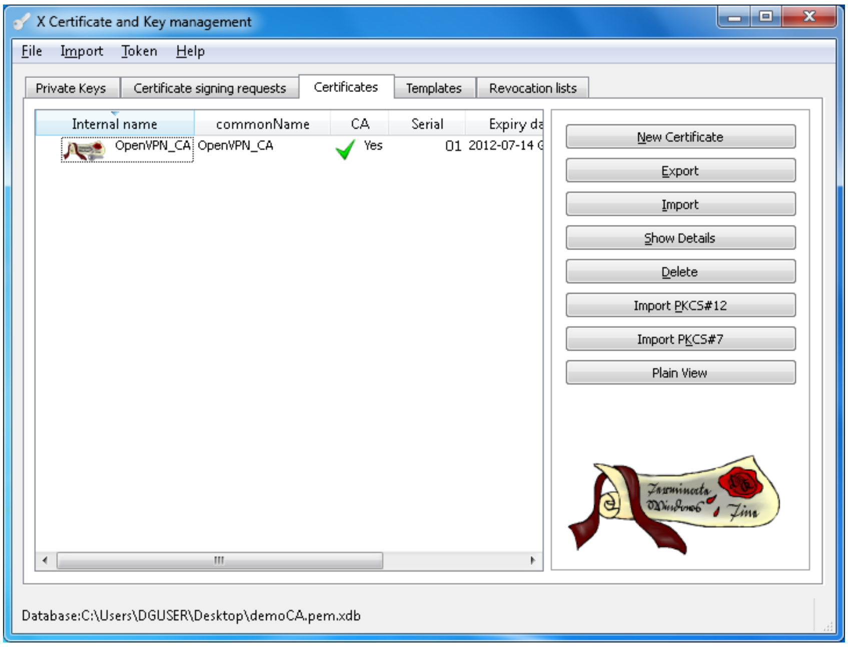
Now click on „**Create**". The following message should appear:



Successfully created the RSA private key 'OpenVPN_CA_3'

CREATING A SERVER CERTIFICATE

Select “**New Certificate**” again.

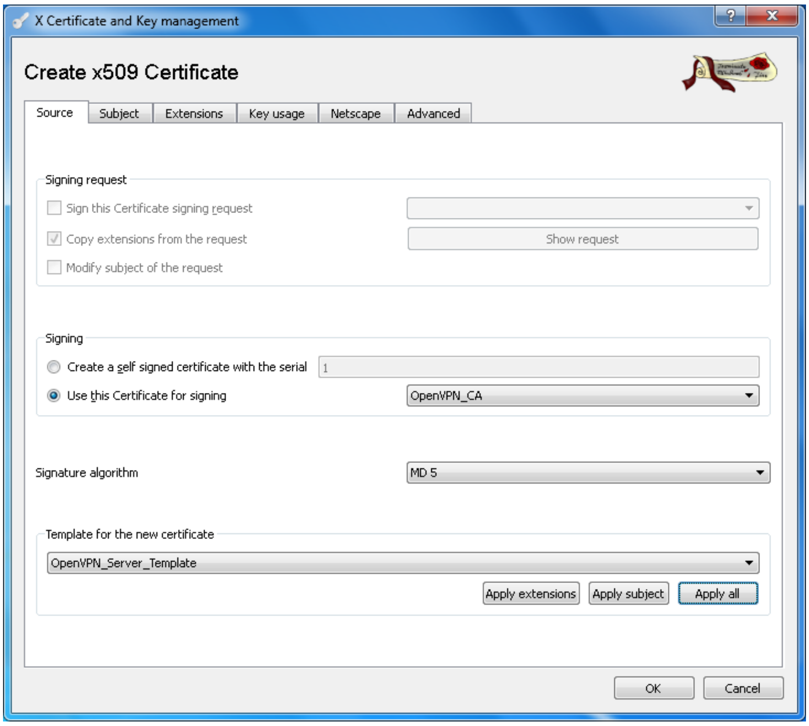


Internal name	commonName	CA	Serial	Expiry da
OpenVPN_CA	OpenVPN_CA	✓ Yes	01	2012-07-14 (

Database:C:\Users\DGUSER\Desktop\demoCA.pem.xdb

Select **'MD5' as „Signature Algorithm**“. Under “**Sign**” change to “**Use this certificate for signing**” and select the just created CA.

This time the Server Template created in the beginning serves as template. Don’t forget to click on **„Apply all**“.



Signing request

□ Sign this Certificate signing request

☑ Copy extensions from the request

□ Modify subject of the request

Signing

○ Create a self signed certificate with the serial 1

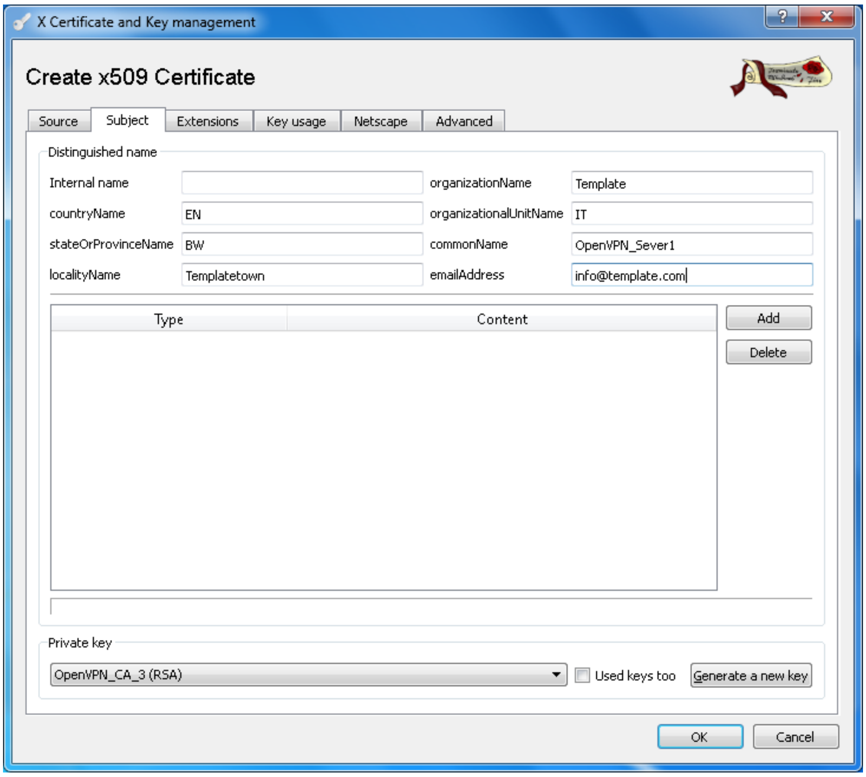
● Use this Certificate for signing: OpenVPN_CA

Signature algorithm: MD 5

Template for the new certificate: OpenVPN_Server_Template

Change again to the tab “**Holder**” and enter a name under “**commonName**”, e.g. "**OpenVPN_Server1**".

All other boxes should have been taken over automatically from the template.



Create x509 Certificate

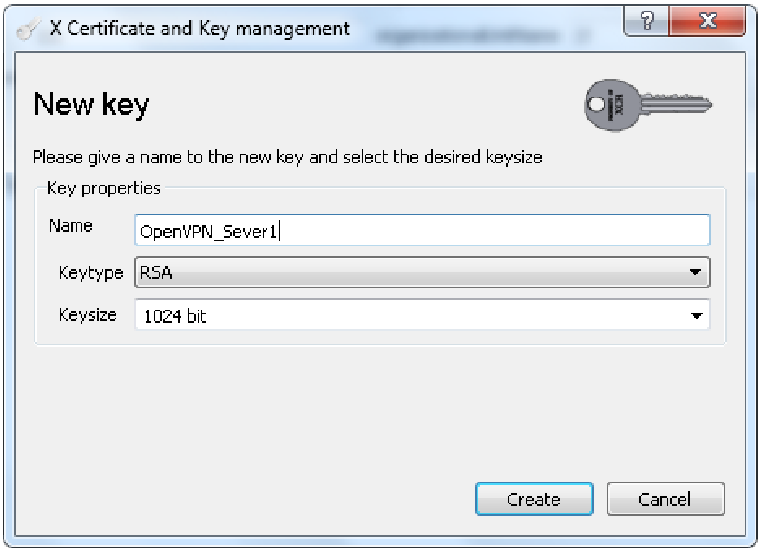
Distinguished name

Internal name		organizationName	Template
countryName	EN	organizationalUnitName	IT
stateOrProvinceName	BW	commonName	OpenVPN_Sever1
localityName	Templatetown	emailAddress	info@template.com

Private key: OpenVPN_CA_3 (RSA) □ Used keys too Generate a new key

Now you only have to create a new key for this certificate.

Change to **"Create a new key"** and enter the same name as the "**commonName**" of this certificate.



New key

Please give a name to the new key and select the desired keysize

Key properties

Name: OpenVPN_Sever1

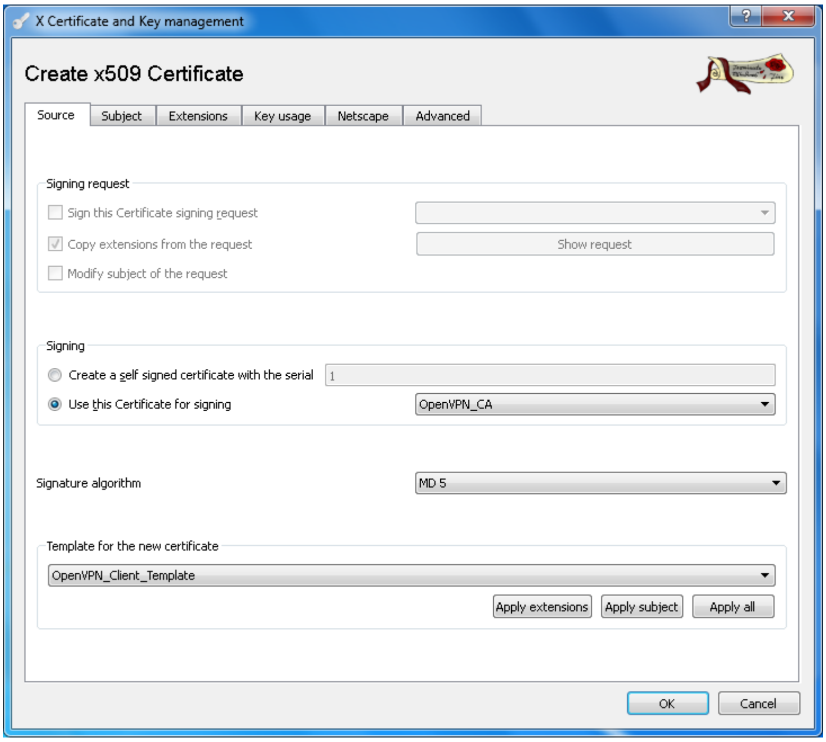
Keytype: RSA

Keysize: 1024 bit

CREATING A CLIENT CERTIFICATE

For each Client an individual certificate must be created.

Repeat all steps as for the Server Certificate, select here however the previously created „**Client Template**".



Create x509 Certificate

Signing request

□ Sign this Certificate signing request

☑ Copy extensions from the request

□ Modify subject of the request

Signing

○ Create a self signed certificate with the serial 1

● Use this Certificate for signing OpenVPN_CA

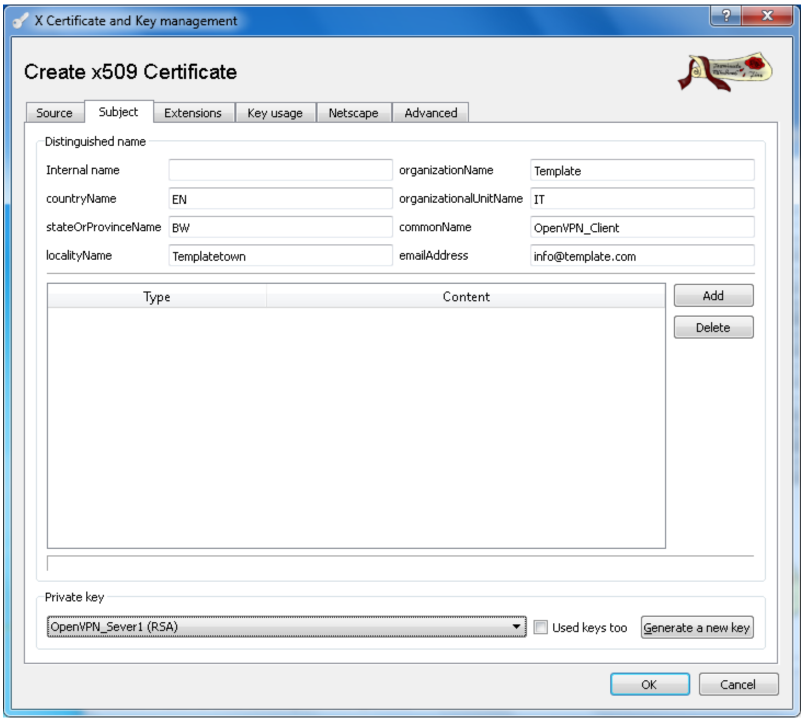
Signature algorithm MD 5

Template for the new certificate

OpenVPN_Client_Template

Note:

- *Each "commonName" must be unique.*
- *For example: OpenVPN_Client1, OpenVPN_Client2, etc..*



X Certificate and Key management

Create x509 Certificate

Source | Subject | Extensions | Key usage | Netscape | Advanced

Distinguished name

Internal name		organizationName	Template
countryName	EN	organizationalUnitName	IT
stateOrProvinceName	BW	commonName	OpenVPN_Client
localityName	Templatetown	emailAddress	info@template.com

Type	Content

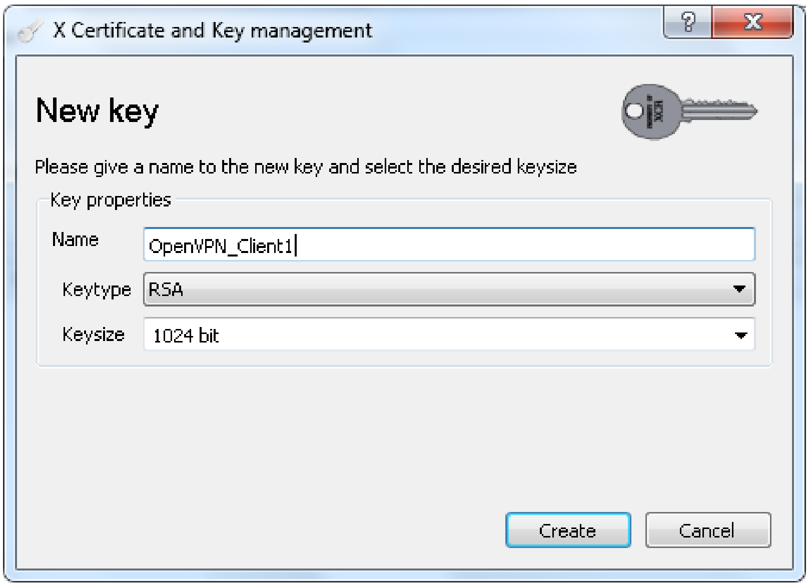
Add
Delete

Private key

OpenVPN_Sever1 (RSA) ▾ □ Used keys too | Generate a new key

OK | Cancel

Now a new key must be created for each Client (name = commonName).



X Certificate and Key management

New key

Please give a name to the new key and select the desired keysize

Key properties

Name: OpenVPN_Client1

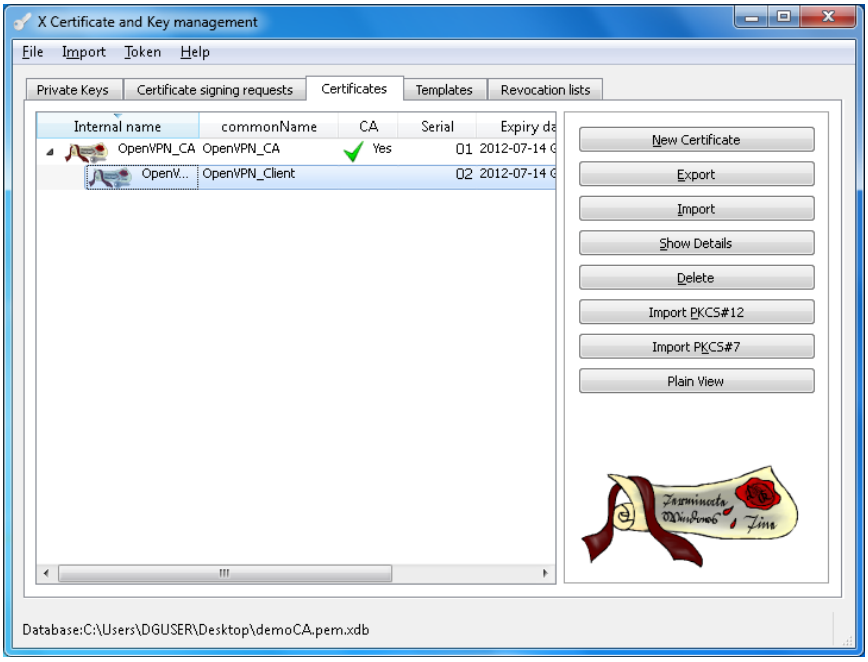
Keytype: RSA

Keysize: 1024 bit

Create | Cancel

EXPORTING AS PKCS#12 FILES

For using key pairs with OpenVPN, those can be exported compactly to a PKCS#12-file. For this purpose use the button "**Export**" under the tab "**Certificates**".



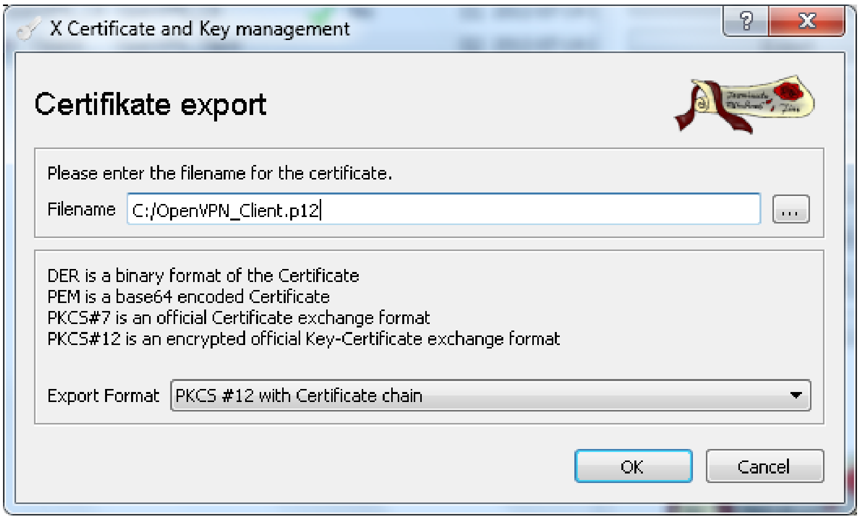
Internal name	commonName	CA	Serial	Expiry da
OpenVPN_CA	OpenVPN_CA	✓ Yes	01	2012-07-14
OpenV...	OpenVPN_Client		02	2012-07-14

Database:C:\Users\DGUSER\Desktop\demoCA.pem.xdb

Mark all Clients and Servers to be exported and click on the button „**Export**". Now select the desired directory to file the Clients and Servers in your system.

Note:

- *Select only* ***"PKCS #12 with Certificate Chain"*** *as export format to ensure that the certificate is managed properly with OpenVPN and the device.*



Please enter the filename for the certificate.

Filename: C:/OpenVPN_Client.p12

DER is a binary format of the Certificate
PEM is a base64 encoded Certificate
PKCS#7 is an official Certificate exchange format
PKCS#12 is an encrypted official Key-Certificate exchange format

Export Format: PKCS #12 with Certificate chain

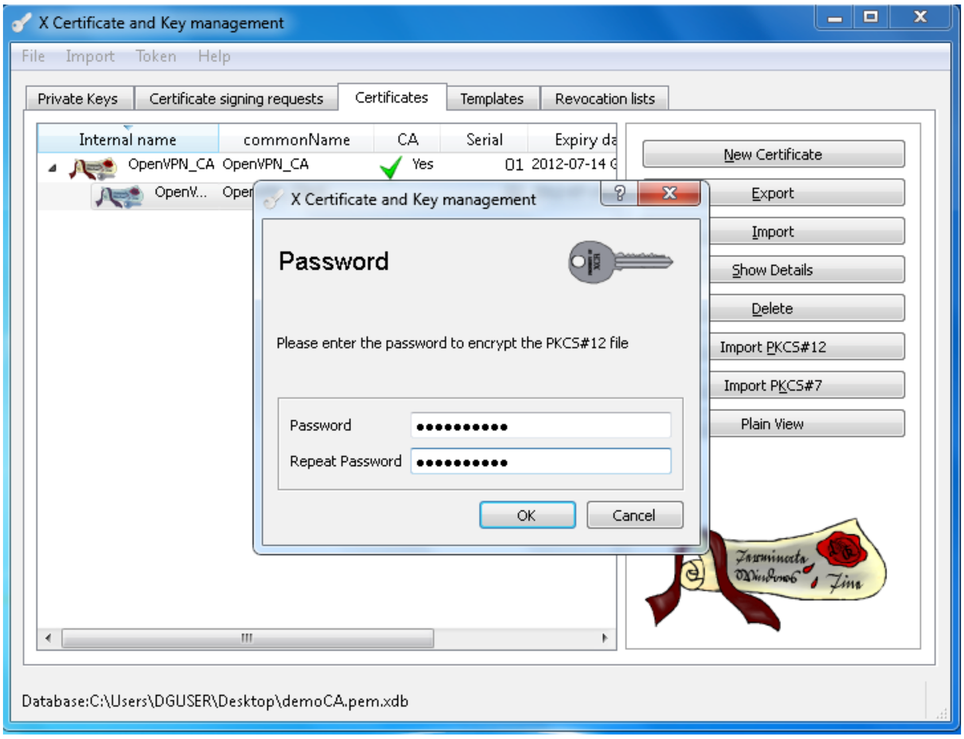
In addition, you may protect the PKCS#12 file with a password. However, don't use a password for the Server because it prevents auto booting on Linux and Windows XP systems. All passwords are required only once for the device during uploading of the certificates on the device.

For the use of VPN Clients under Linux or Windows, the password must be entered with each new connection with the network.

Under certain circumstances it may also make sense to leave all boxes empty and to assign no password. Instead of using a password, a limitation of the validity period can also protect from undesired use.

Hint: To reduce the Server load, you may adjust on the device that the VPN connection is only initiated through the key switch in the switch cabinet.

If you want to use a password, choose a possibly safe one:



Internal name	commonName	CA	Serial	Expiry da
OpenVPN_CA	OpenVPN_CA	✓ Yes	01	2012-07-14
OpenV...	Oper			

Password

Please enter the password to encrypt the PKCS#12 file

Password ●●●●●●●●●●

Repeat Password ●●●●●●●●●●

Database:C:\Users\DGUSER\Desktop\demoCA.pem.xdb

Integrating Certificates in OpenVPN

If you want to use the certificates on the PC where also XCA runs, you still have to copy the certificates - after having created and exported them - into the OVPN directory.

If you want to use the certificates on the device, make sure that the device is connected with the PC and you have access to the web interface.

Go to „**General / Certificates**" now and click on the "**Upload**" button. Search for the directory where your certificates are filed and choose by a double click which one you want to upload onto the device. If the certificate is protected by a password, enter the password now.

Go to „**Configuration / OpenVPN**" to configure your OpenVPN settings. The uploaded certificate should now be available in the drop-down menu.

For using the p12 file in a normal OpenVPN configuration, enter the following after the below section:

```
# SSL/TLS parms.
# See the server config file for more
# description.  It's best to use
# a separate .crt/.key file pair
# for each client.  A single ca
# file can be used for all clients.
```

```
pkcs12 "…OpenVPN\\cert\\OpenVPN_Client1.p12"
```

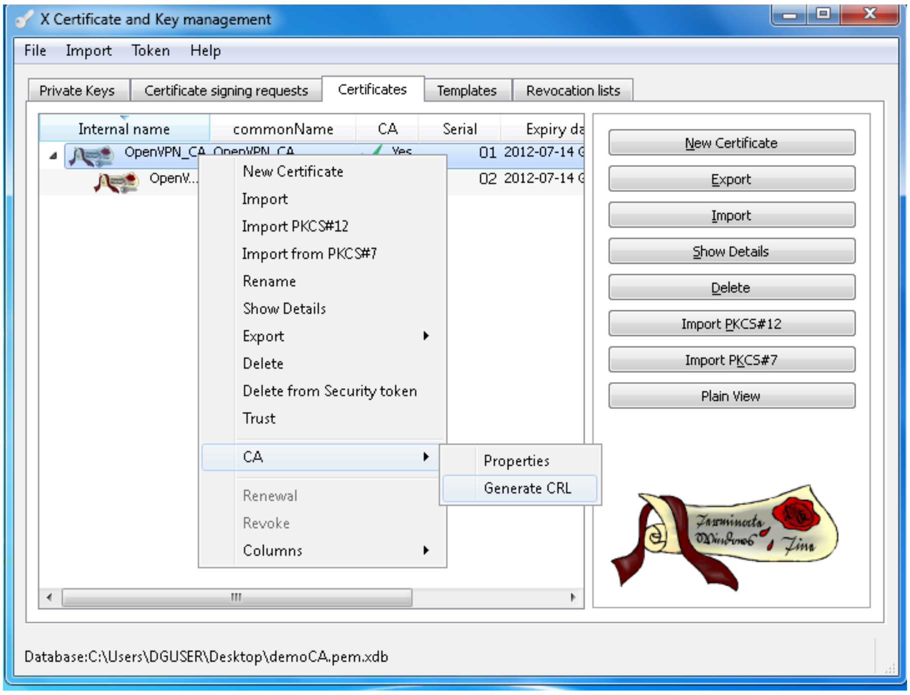
All other data types described in the OVPN file can be ignored.

Creating a CRL (Certificate Revocation List)

XCA additionally offers a function for the creation of a CRL on the basis of its CA and certificate chain.

A CRL is a list of all certificates including their respective status of validity. In this way it is possible to easily withdraw individual certificates from the server.

It is a special file that was created in XCA and that can be uploaded onto the device like a certificate.

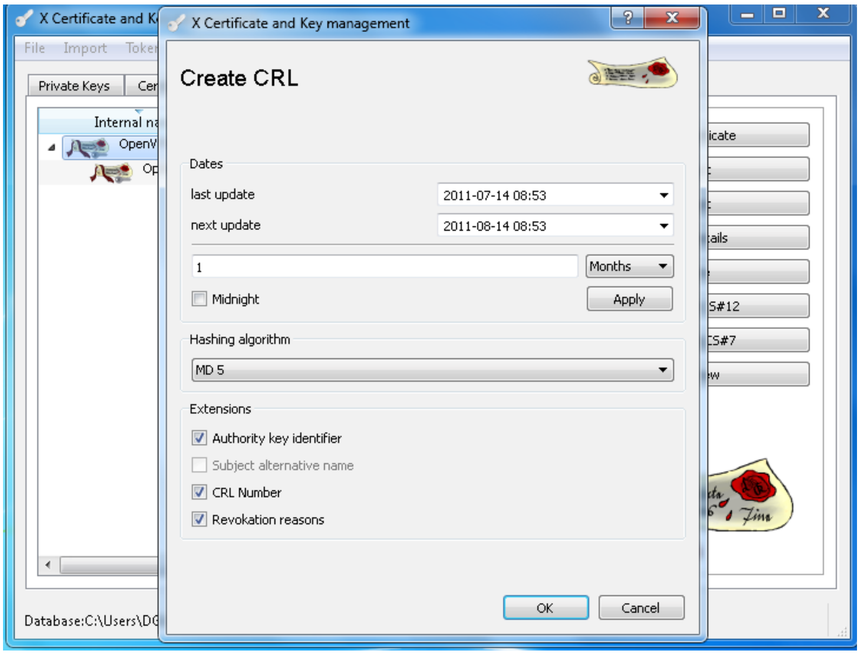


Internal name	commonName	CA	Serial	Expiry da
OpenVPN_CA	OpenVPN_CA	✓ Yes	01	2012-07-14 (
OpenV...			02	2012-07-14 (

Database:C:\Users\DGUSER\Desktop\demoCA.pem.xdb

Determine the validity period and the time for the next update. Your next update should be as far in the future as possible, normally there is no other reason for creating a new certificate than the loss of the old one.

Checkmark the three boxes as shown on the next screenshot and then confirm with „**OK**“.



X Certificate and Key management

Create CRL

Dates

last update: 2011-07-14 08:53

next update: 2011-08-14 08:53

1 Months

☐ Midnight

Hashing algorithm: MD 5

Extensions

☑ Authority key identifier

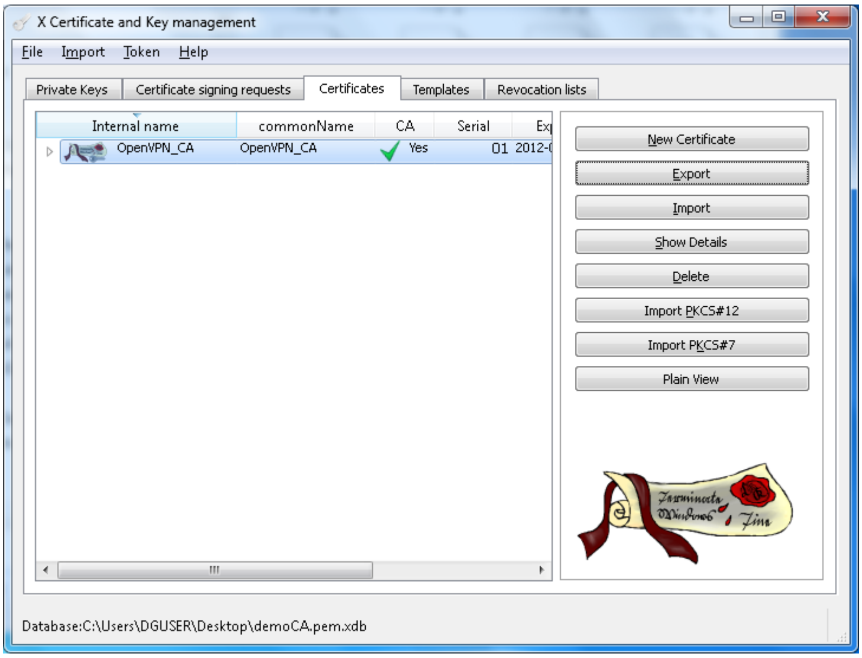
☐ Subject alternative name

☑ CRL Number

☑ Revokation reasons

Database:C:\Users\DG

After creating the CRLs, you find them under the last tab of the main menu: „**Revocation Lists**“.



X Certificate and Key management

Internal name	commonName	CA	Serial	Ex
OpenVPN_CA	OpenVPN_CA	✓ Yes	01	2012-(

Database:C:\Users\DGUSER\Desktop\demoCA.pem.xdb

Click on “**Export**” to upload the CRL onto the device:

Choose „PEM“ as file format. The file name assigned by XCA should already have the correct file extension due to the previous selection.

The CRL PEM file is now in the directory where the other certificates have already been exported. For uploading them onto the Master device, proceed exactly as for uploading of a normal certificate:

Go to the web interface **„Configuration / General Settings / Certificates**", click on „Browse" and select the CRL. Then upload the file onto the device via **„Upload Certificate**".

All installed and integrated certificates are verified against the new CRL. If you want to trust a previously revoked certificate, select this specific certificate in the XCA by a right click and change its status to **„Regain Trust**" . Further, create a new CRL by exporting and uploading as described above.

If the copy of the certificate is on your device, you will notice that the status in the web interface has also changed into **„Regain Trust**".

This may be useful to temporarily deny VPN access for certain users and machines.

Note:

- *Even if the validity period of a revocation list is expired, it is used to verify the certificates as long as there is no updated CRL available.*
- *The revocation lists on the device (at last one for each CA) should be kept up to date as far as possible in order to prevent the formation of security gaps due to lost certificates.*

INCREASED SECURITY WITH DH:

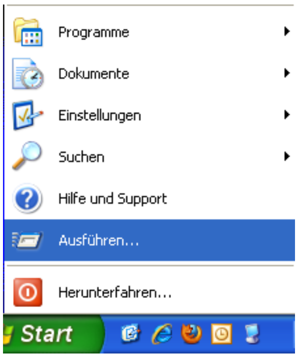
For security reasons, it is recommended to use XCA with an independent DH file.

This can be realised with OpenSSL.

If you do not have it yet, you can download OpenSSL with standard options under the following link:

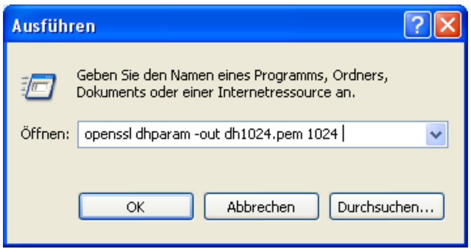
http://www.openssl.org/related/binaries.html

After installation, select "**Start & Execute**" in the start menu. Enter "**CMD**" here and then press the Enter key.



Now open the directory: **C:\OpenSSL-Win32\bin\** and enter the following command:

openssl dhparam -out dh1024.pem 1024



Geben Sie den Namen eines Programms, Ordners, Dokuments oder einer Internetressource an.

Öffnen: openssl dhparam -out dh1024.pem 1024

The new file dh1024.pem is to be stored on the OpenVPN server and provides increased security during use.

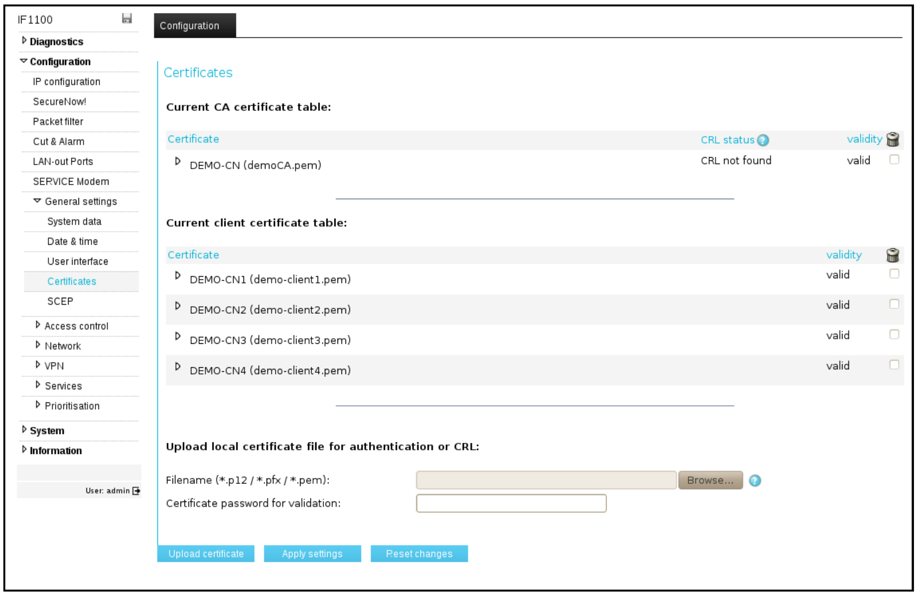
In future, the creation of DH files will also be integrated directly in the XCA. In the used version however it does not work without errors.

Additional Notes

XCA offers many possibilities and further functions which might be useful in the future. Please contact us if you have any further questions or need more help when creating your certificates.

Uploading Certificates onto the Device

CA certificates, normal certificates (Client certificates) as well as revocation lists are all uniformly uploaded onto the device via the certificate interface. If an invalid CA certificate is stored on the device, all certificates signed by this CA are considered to be trustworthy unless registered in a CRL.



Certificates

Current CA certificate table:

Certificate	CRL status	validity	
DEMO-CN (demoCA.pem)	CRL not found	valid	□

Current client certificate table:

Certificate	validity	
DEMO-CN1 (demo-client1.pem)	valid	□
DEMO-CN2 (demo-client2.pem)	valid	□
DEMO-CN3 (demo-client3.pem)	valid	□
DEMO-CN4 (demo-client4.pem)	valid	□

Upload local certificate file for authentication or CRL:

Filename (*.p12 / *.pfx / *.pem):

Certificate password for validation:

If the PKCS12 Container or the certificate itself is provided with a password, the latter must be entered when uploading. The uploading process itself is then activated by means of the „Upload certificate".

Note:

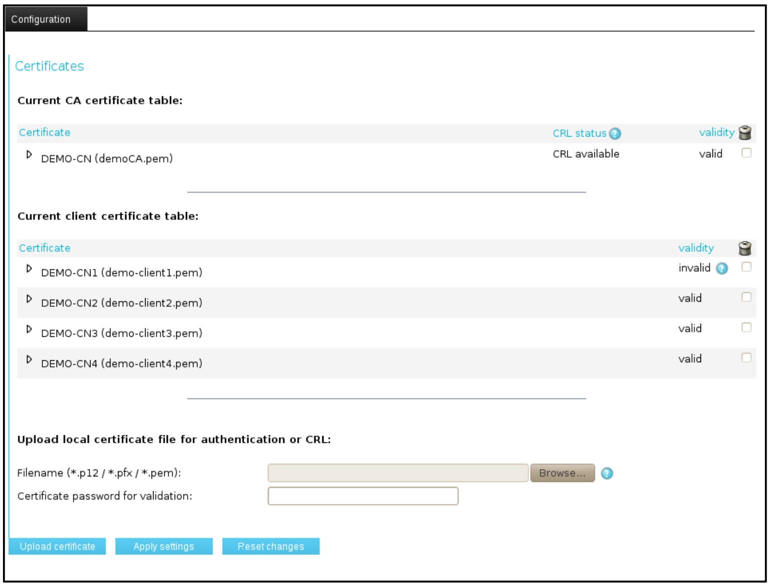
For uploading onto the device, a certificate must be available in form of a PKCS12 file or in PEM format with integrated private key.

The private key (e.g. myClient1.key) must be protected from unauthorized access.

In case of an external CA, a certificate request is generated and sent to the Certificate Authority. The authority checks the given information and (if the information is correct) signs the request. Then the certificate created as a result can be used for authentication.

For deletion of a certificate, tick the desired certificate below the wheelie bin symbol and click on „Apply Settings".

If there is a revocation list for a CA certificate, this is indicated in the „CRL Status" column.



Certificates

Current CA certificate table:

Certificate	CRL status	validity	🗑
▷ DEMO-CN (demoCA.pem)	CRL available	valid	□

Current client certificate table:

Certificate	validity	🗑
▷ DEMO-CN1 (demo-client1.pem)	invalid	□
▷ DEMO-CN2 (demo-client2.pem)	valid	□
▷ DEMO-CN3 (demo-client3.pem)	valid	□
▷ DEMO-CN4 (demo-client4.pem)	valid	□

Upload local certificate file for authentication or CRL:

Filename (*.p12 / *.pfx / *.pem):

Certificate password for validation:

Note:

For uploading a certificate as PEM file, the certificate must contain the private key. This does not apply to CA certificates.

A CRL can only be uploaded successfully if the related CA certificate is already available on the device.

If a CA certificate is deleted, the related CRL file is deleted automatically.

The CA certificates demoCA.pem and/or myCA.pem, respectively, as well as the certificates signed hereby demo-clientX.pem and/or myClientX.pem exclusively serve the purpose of testing and may not be used for authentication.

Error Messages for Uploaded Certificates

In the validity column it is indicated if a successfully uploaded certificate may really be used. If it is not possible to use it, click on the small question mark to indicate the exact error message.

If the certificate is not yet valid or not valid any more, the following message will appear:

Error 9 at 0 depth lookup: certificate is not valid yet.

Solution: Set the system time correctly; or if a certificate is really invalid, the issuer must request a new certificate.

If the matching CA certificate is not available for the normal certificate, the following message will appear:

Error 20 at 0 depth lookup: unable to get local issuer certificate

Solution: The respective CA certificate must be uploaded.

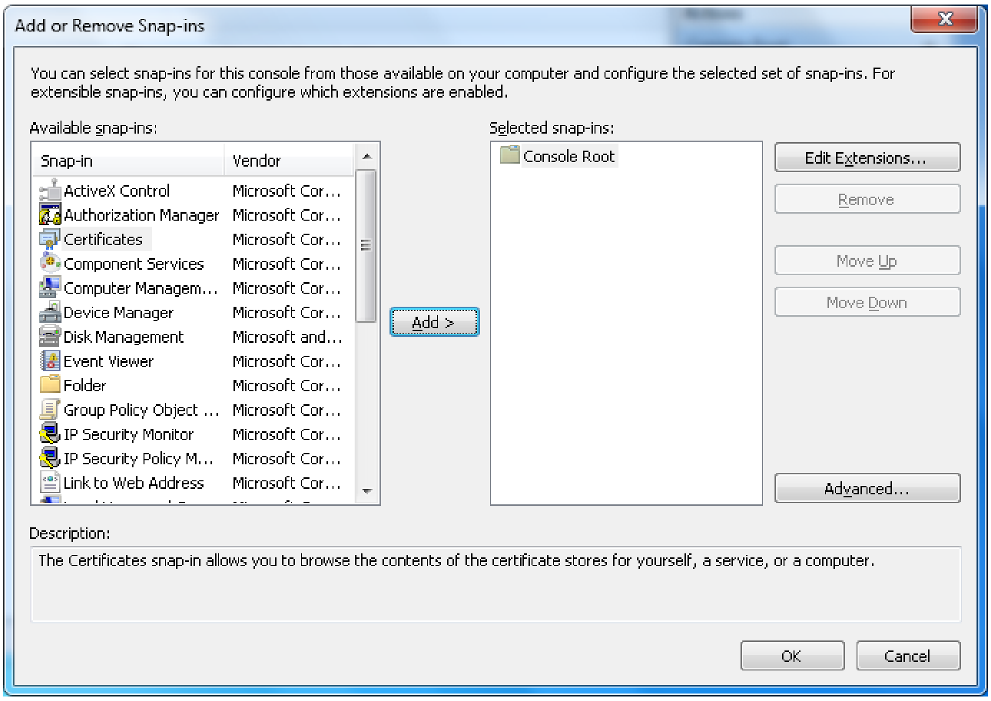
If a normal certificate is uploaded and exactly the same identity details are used as for the CA certificate by which it is signed, the following message will appear:

Error 7 at 0 depth lookup: certificate signature failure

Solution: The certificate must be remade. For this purpose a new Client Request has to be made first and at least one identity box (e.g. common name) must differ from the entries in the CA certificate.

IMPORTING CERTIFICATES UNDER WINDOWS

First start the „Microsoft Management Console". For this purpose enter the command mmc under Start/Execute… Load the Snap-In certificate for the computer account of the local computer in the console under Add/Delete File/Snap-In:



Add or Remove Snap-ins

You can select snap-ins for this console from those available on your computer and configure the selected set of snap-ins. For extensible snap-ins, you can configure which extensions are enabled.

Available snap-ins:

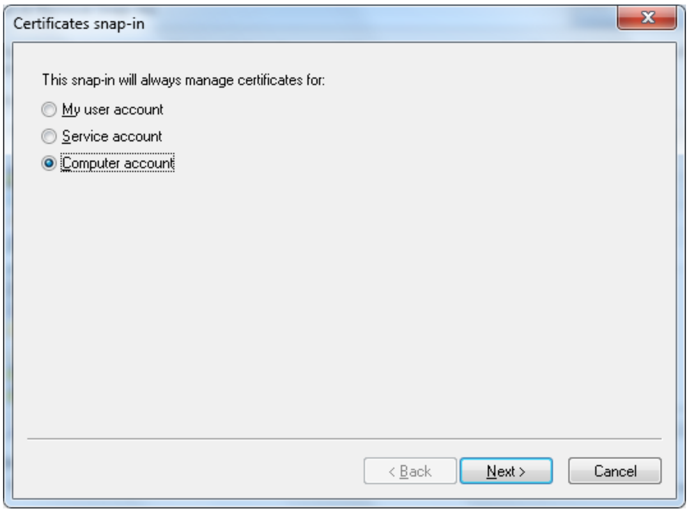
Snap-in	Vendor
ActiveX Control	Microsoft Cor…
Authorization Manager	Microsoft Cor…
Certificates	Microsoft Cor…
Component Services	Microsoft Cor…
Computer Managem…	Microsoft Cor…
Device Manager	Microsoft Cor…
Disk Management	Microsoft and…
Event Viewer	Microsoft Cor…
Folder	Microsoft Cor…
Group Policy Object …	Microsoft Cor…
IP Security Monitor	Microsoft Cor…
IP Security Policy M…	Microsoft Cor…
Link to Web Address	Microsoft Cor…

Selected snap-ins:

Console Root

Description:

The Certificates snap-in allows you to browse the contents of the certificate stores for yourself, a service, or a computer.



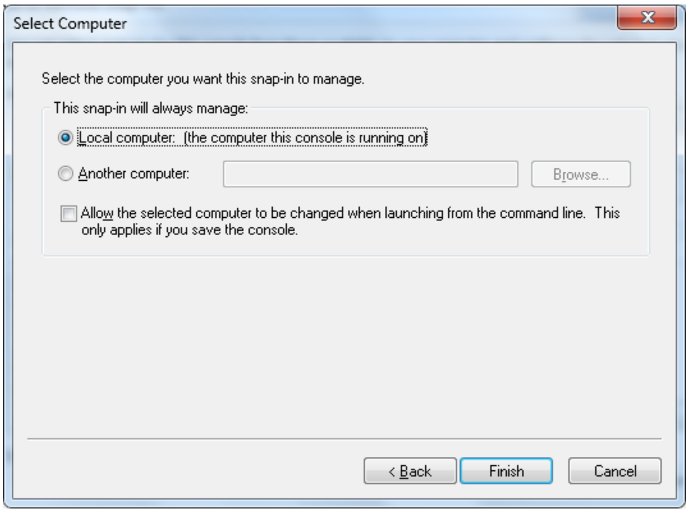
Certificates snap-in

This snap-in will always manage certificates for:

○ My user account

○ Service account

● Computer account



Select Computer

Select the computer you want this snap-in to manage.

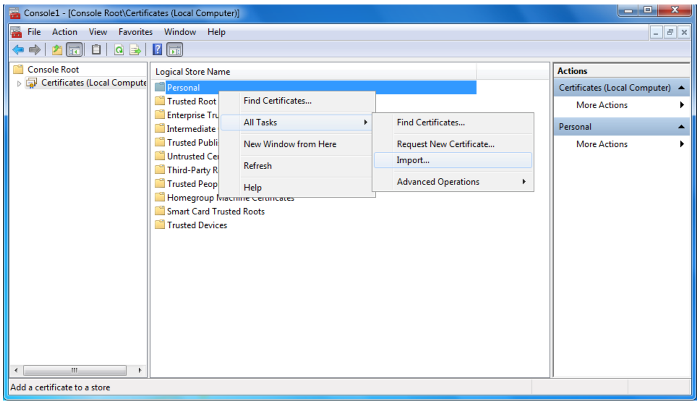
This snap-in will always manage:

● Local computer: (the computer this console is running on)

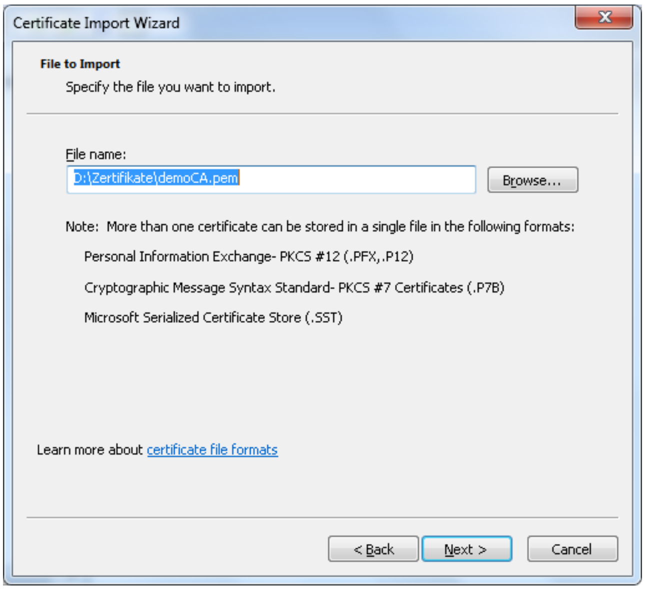
○ Another computer:

□ Allow the selected computer to be changed when launching from the command line. This only applies if you save the console.

The menu is opened by a right click on the certificate folder. Then the Certificate Import wizard is started via All Tasks/Import:



As next, the certificate file is chosen:



Certificate Import Wizard

File to Import

Specify the file you want to import.

File name:

D:\Zertifikate\demoCA.pem

Note: More than one certificate can be stored in a single file in the following formats:

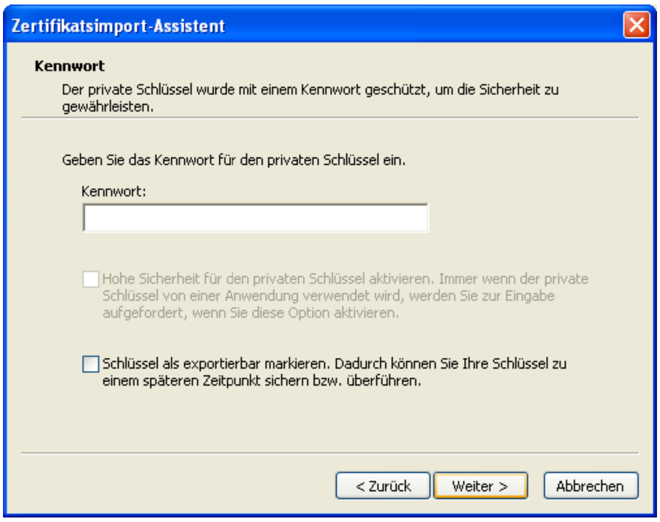
Personal Information Exchange- PKCS #12 (.PFX,.P12)

Cryptographic Message Syntax Standard- PKCS #7 Certificates (.P7B)

Microsoft Serialized Certificate Store (.SST)

Learn more about certificate file formats

If the container or the certificate is protected by a password, this must be indicated for import (the container example demo-client2.p12 has no password, therefore it is possible to click on Continue directly):



Zertifikatsimport-Assistent

Kennwort

Der private Schlüssel wurde mit einem Kennwort geschützt, um die Sicherheit zu gewährleisten.

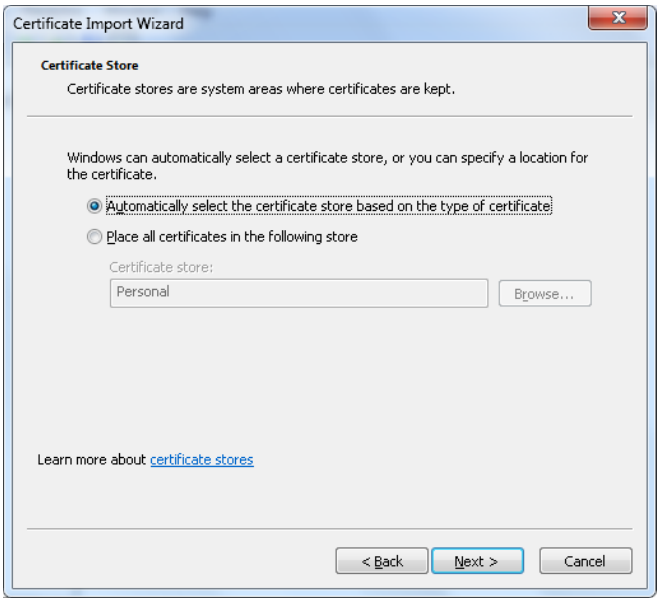
Geben Sie das Kennwort für den privaten Schlüssel ein.

Kennwort:

☐ Hohe Sicherheit für den privaten Schlüssel aktivieren. Immer wenn der private Schlüssel von einer Anwendung verwendet wird, werden Sie zur Eingabe aufgefordert, wenn Sie diese Option aktivieren.

☐ Schlüssel als exportierbar markieren. Dadurch können Sie Ihre Schlüssel zu einem späteren Zeitpunkt sichern bzw. überführen.

The classification of the certificates must be effected automatically (allowing for example to sort from PKCS12 Container the demo-client2.p12 demo-client2.pem as certificate and demoCA.pem as Root Certificate):



Certificate Import Wizard

Certificate Store

Certificate stores are system areas where certificates are kept.

Windows can automatically select a certificate store, or you can specify a location for the certificate.

● Automatically select the certificate store based on the type of certificate

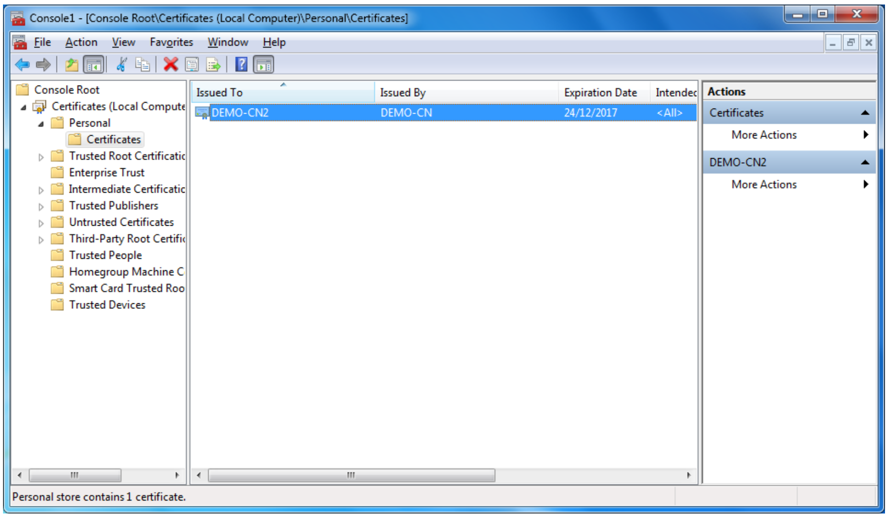
○ Place all certificates in the following store

Certificate store:

Personal

Learn more about certificate stores

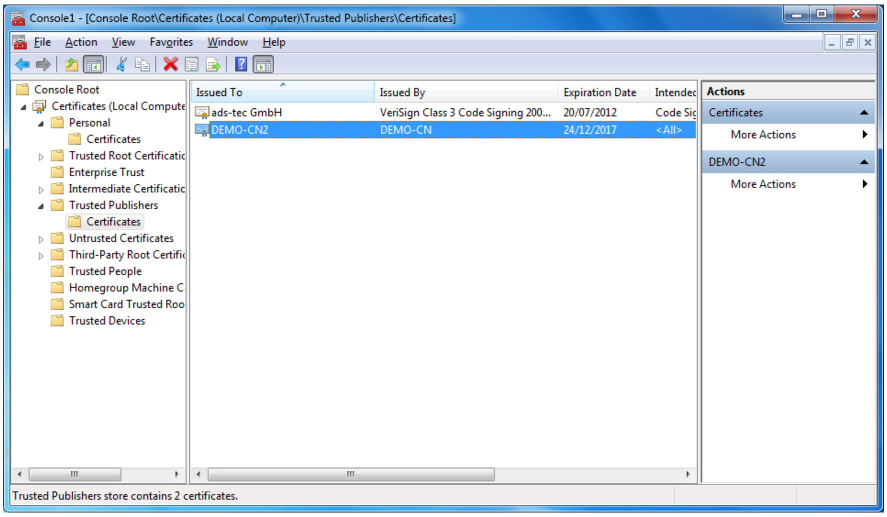
Finally, import must be completed. The certificates can be viewed under Own Certificates and the root certificates under Trustworthy Root Certificates. It is possible that these directories are first to be updated (right click and select Update in the menu).


Console1 - [Console Root\Certificates (Local Computer)\Personal\Certificates]

- Console Root
  - Certificates (Local Compute
    - Personal
      - Certificates
    - Trusted Root Certificatio
    - Enterprise Trust
    - Intermediate Certificatio
    - Trusted Publishers
    - Untrusted Certificates
    - Third-Party Root Certific
    - Trusted People
    - Homegroup Machine C
    - Smart Card Trusted Roo
    - Trusted Devices

Issued To	Issued By	Expiration Date	Intendec
DEMO-CN2	DEMO-CN	24/12/2017	<All>

Personal store contains 1 certificate.


Console1 - [Console Root\Certificates (Local Computer)\Trusted Publishers\Certificates]

- Console Root
  - Certificates (Local Compute
    - Personal
      - Certificates
    - Trusted Root Certificatio
    - Enterprise Trust
    - Intermediate Certificatio
    - Trusted Publishers
      - Certificates
    - Untrusted Certificates
    - Third-Party Root Certific
    - Trusted People
    - Homegroup Machine C
    - Smart Card Trusted Roo
    - Trusted Devices

Issued To	Issued By	Expiration Date	Intendec
ads-tec GmbH	VeriSign Class 3 Code Signing 200...	20/07/2012	Code Sig
DEMO-CN2	DEMO-CN	24/12/2017	<All>

Trusted Publishers store contains 2 certificates.

Note:

- *In addition to the actual certificate demo-client2.pem, the PKCS12 File demo-client2.p12 also contains the root certificate demoCA.pem.*
- *If the root certificate is not included in the own certificates in the container, it must be imported analogously.*

12.3 SIM Card

General

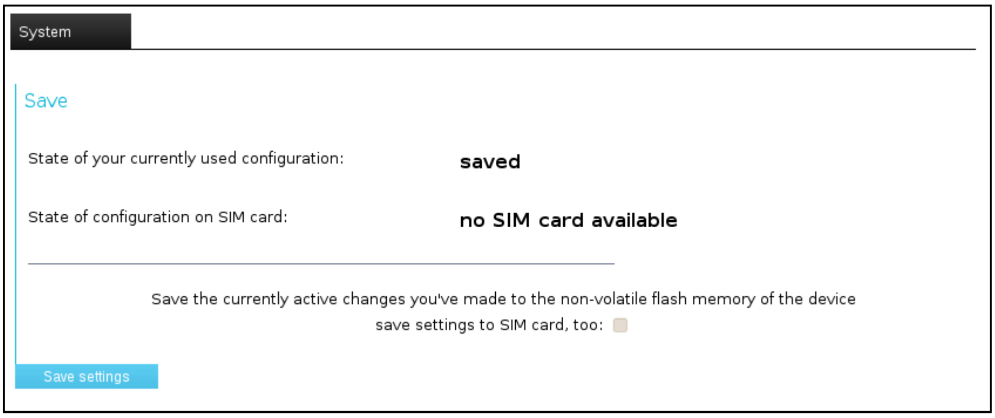
A defective device can easily be exchanged by means of the SIM card. The SIM card from the defective device has just to be inserted in the replacement device. Involvement of skilled personnel is not required.

Type of SIM Card

Use only SIM cards from ads-tec.

Saving Configuration on the SIM Card

If no SIM card is inserted, the message „No SIM card available" is indicated.



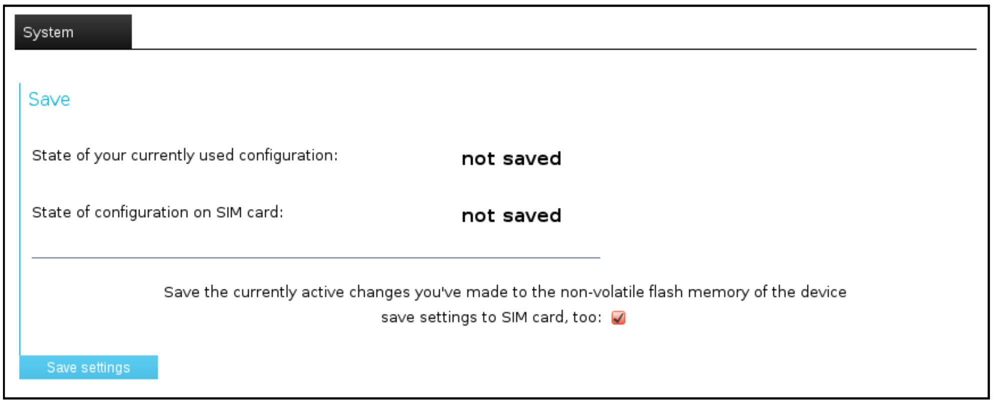
State of your currently used configuration: **saved**

State of configuration on SIM card: **no SIM card available**

Save the currently active changes you've made to the non-volatile flash memory of the device

save settings to SIM card, too: □

To save the settings on the SIM card, activate the checkbox „Save settings also on SIM card" in the „Save" dialogue and then click on the Save button.



State of your currently used configuration: **not saved**

State of configuration on SIM card: **not saved**

Save the currently active changes you've made to the non-volatile flash memory of the device

save settings to SIM card, too: ☑

Replacing a device

Insert the SIM card in an off-device and switch on the device. The settings are now loaded during booting. The following messages appear in the Event log:

Examples:

Successfully retrieved settings:
Nov 1 00:00:05 IF1xxx system: successfully loaded config from SIM card

Successfully updated SIM card saved on other firmware than before:
Nov 1 00:00:05 IF1xxx system: successfully updated SIM card config to firmware version: 1.1.1

➔ ***Note:***

If a SIM card is saved on a device with a currently used firmware and then inserted in a device with older firmware, all new parameters of the new firmware are deleted automatically since those are not available on the old firmware. This also applies to the data saved on the SIM card.

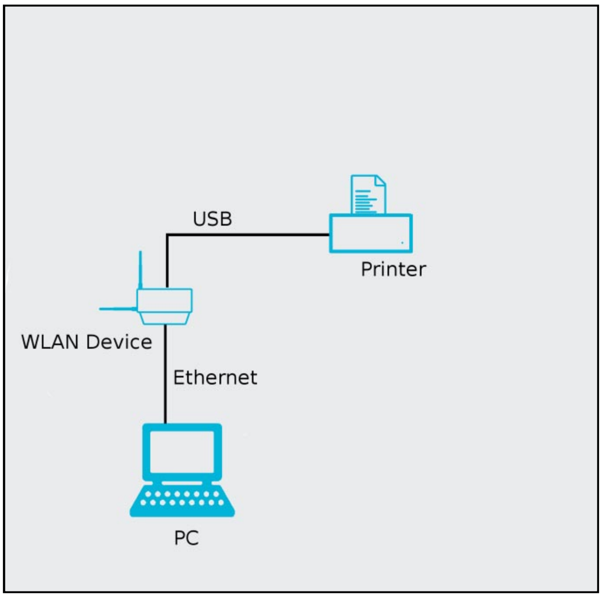
(Only applicable to RAP/RAC!) A configured SIM card cannot be exchanged between two different device types. If e.g. the configuration is saved on an RAP111x onto the SIM card, the SIM card will not be readable if it is inserted in an RAC111x. Rewriting of the card however will be possible at any time.

RAP/RAC devices with an older hardware version however cannot provide this function despite the available card slot. In such cases the SIM card functions are not visible.

12.4 USB Printer

General

WLAN devices equipped with USB ports can release exactly one USB printer for the network. The WLAN devices do not need to be configured. Further, always the first identified printer is made available at the TCP Port 9100. As shown, the printer can be connected via Ethernet or WLAN.



CONFIGURATION

Configuration of the printer under Windows XP

- The manufacturer’s printer driver must be installed if Windows does not innately support the used printer.
- New printers are added in system control under „**Printers and Fax Devices**“. For this purpose select menu item „**Add Printer**“ via the file menu.
- Select „**Local Printer**“ in the subsequent dialogue and confirm with „**Continue**“.
- When the dialogue window „**Printer Port**“ is opened, select „**Install a new Port**“ and then „**Standard TCP/IP Port**“ in the menu. Click on „**Continue**“.
- Fill in the printer field or IP address and click on „**Continue“.**
- In the next step, select „**User-defined**“, enter the Port 9100 via „**Settings**“ and select RAW as protocol.
- After completion of the printer port wizard, select the corresponding printer driver to complete the installation.

CONFIGURATION OF PRINTER UNDER LINUX BY MEANS OF CUPS

- The CUPS configuration is started by means of a browser under the address: **http://localhost:631**.
- The wizard is started via the entry „**Add Printer**“.
- On the first page the name of the printer must be filled in at least, all other details are optional.
- In the next step, select „**Internet Printing Protocol (IPP)**“ and confirm by clicking on „**Continue**“.
- Enter the IP address and the port in the URI box as follows: **socket://<IP>:<PORT>.** The port must be fixed at 9100.
- In the last step, select the appropriate printer driver, then the wizard is completed.

12.5 Overview of Client Operation Modes

Wireless networks become more and more complex and diverse. A huge number of various manufacturers and functions mostly make the connection with other Clients increasingly difficult. This Use Case shall help to determine the appropriate operation mode of the ads-tec WLAN Client and in this way to achieve the best possible roaming performance.

Access Point	Bridge Mode (for operation mode without router)	Roaming Mode Single Client	Roaming Mode Dual Client
Not compatible with ads-tec	MCB / SCB	Standard Roaming	Extended Background Scanning
Compatible with ads-tec	FTB	Standard Roaming	Extended Background Scanning
Wireless Controller without security measures (e.g. Motorola)	MCB / SCB	Standard Roaming	Extended Background Scanning
Wireless Controller with security measures /e.g. Cisco)	-	Standard Roaming im Router Modus	Extended Background Scanning & IP Router
ads-tec Access Point	FTB	Standard Roaming	Seamless Roaming

Bridge Mode

The ads-tec WLAN Clients know three different bridge modes.

FTB (**F**ully **T**ransparent **B**ridge): Can be used for ads-tec compatible Access Points. Here all devices downstream from the WLAN Client can be activated on Layer 2.

For all non-compatible ads-tec Access Points, one of the following bridge modes is needed.

MCB (**M**ulti **C**lient **B**ridge): All Ethernet users downstream from the WLAN Client are masked with the MAC address of the WLAN interface. Here the first device is fully masked transparently on Layer 2, while the other devices are provided with a transparent access through Layer 3 (i.e. only protocol data can be transferred).

SCB (**S**ingle **C**lient **B**ridge): Here exactly one Ethernet user is masked who is provided full transparent access through Layer 2, his MAC address must however be entered manually in the web interface of the WLAN Client.

➔

Note:

In the operation mode of the IP Router or Extended Background Scanning & IP Router, a bridge mode is not needed, the configuration side is deactivated.

Roaming mode

- Standard Roaming: This is the slowest of all roaming modes. Here criteria are defined according to which the WLAN Client falls back into the Scan status and scans all channels. Depending on the number of channels to be scanned, this may last several seconds.
- Extended Background Scanning: In this roaming mode, the WLAN interface keeps up the data link, while the second one searches for further Access Points. If the configurable criteria for an Access Point change are dropped below, then the first WLAN interface directly logs in at the new Access Point. Scanning is dropped allowing for roaming times from 10 to 50ms.
- Extended Background Scanning & IP Router: This roaming mode does not differ in its roaming characteristics from the Extended Background Scanning. However, this mode is able due to the combination with the IP router mode to build up another IP network downstream from its WLAN interface. By communicating with NAT and Port Forwarding, masked access to Wireless Controllers can be realised in this way despite the safety functionality.
- Seamless Roaming: This roaming mode only works in combination with ads-tec Access Points. Both interfaces build up data links while always only one interface sends data actively. If necessary, the roles can be exchanged. So interruption-free roaming processes can be realised.

12.6 EXTENDED BACKGROUND SCANNING AND ROUTER

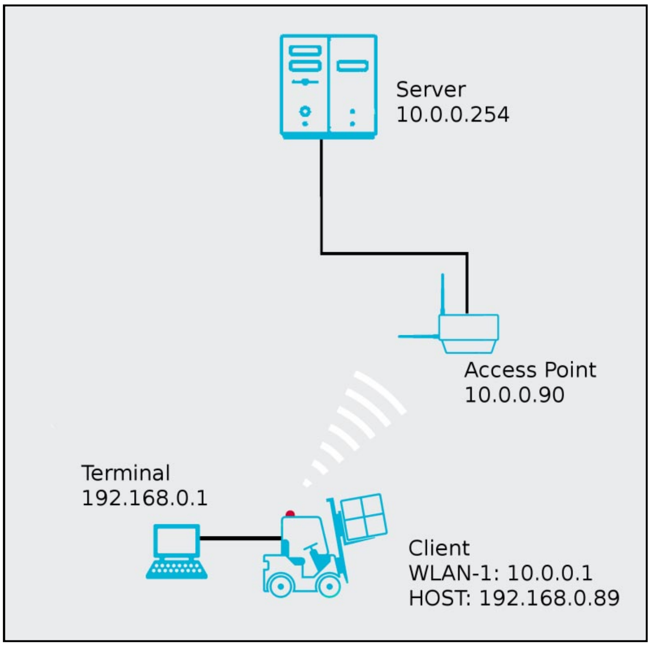
With the increasing use of Wireless Controllers, there are also other safety functions that have been integrated in the WLAN networks. For example, modern Wireless Controllers filter out Ethernet packets and block WLAN Clients once these Clients use more than one IP address. This always causes problems if Ethernet segments are to be bridged, i.e. if there are still other devices, mostly linked via Ethernet, to be operated downstream from the WLAN Client.
To solve this problem it is necessary to make sure that on the part of the Wireless Controller only one IP address is used for each WLAN Client. The WLAN Client can simultaneously be in two networks, one for the Wireless Interface and the other one for the Ethernet Interface. Then however routing functions on the WLAN Client and respective Gateway entries are required on all user devices.
For easier configuration, it is recommended to activate NAT (Network Address Translation) on the WLAN Client. Thus the devices in the Wireless Network do not need to know of the private Ethernet network downstream from the Client. In other words, Ethernet users are "disguised‟.
Further, Port Forwarding allows direct addressing of individual Ethernet Clients downstream from a NAT Router so that for example a server can, within the wireless network, query the devices downstream from the WLAN Client. Otherwise, each communication has always to be started by the WLAN Clients.
The ads-tec WLAN devices offer the so-called „Extended Background Scanning und IP Router‟ mode for such environments the configuration of which will be explained in the following.

Explanation of configuration by the example of the following topology:

→192.168.0.0/255.255.255.0 is the private disguised network downstream from the WLAN Clients.

→10.0.0.0/255.255.255.0 is the real WLAN network where the Access Points and Clients (WLAN-1 interface) are located.

→The terminal must be configured with the correct Gateway address. In the given example this is the HOST address of the WLAN Client (192.168.0.89).

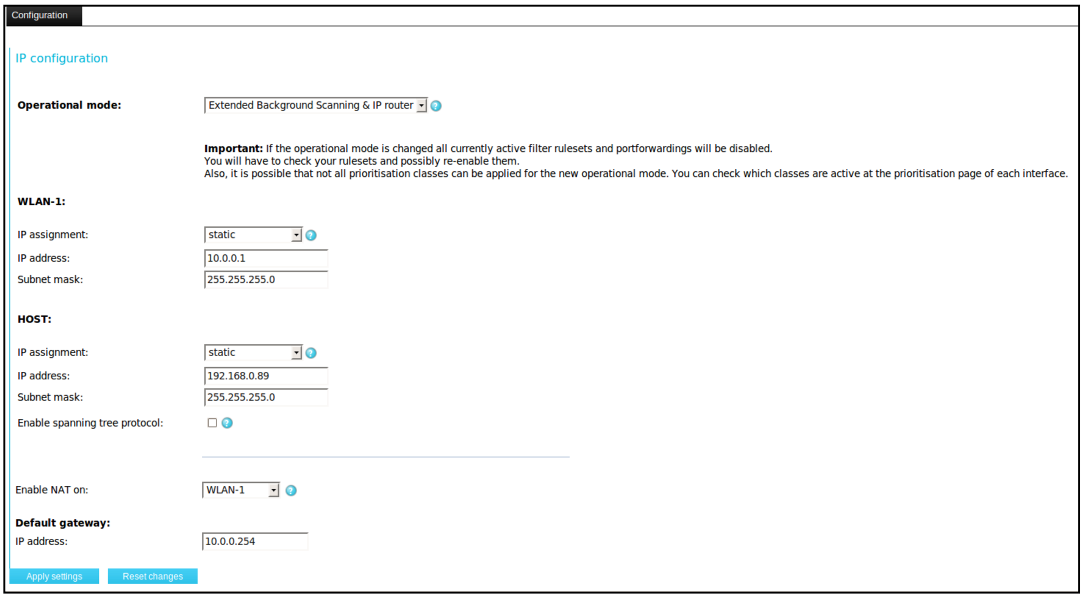


> ***Note:***
> *The private network can appear with identical configuration within the whole setups as often as desired. That means it is possible to configure all terminals with IP 192.168.0.1 and all WLAN Clients at the HOST interface with IP 192.168.0.89. Just the WLAN-1 IP address must be unique in the network; but here it is also possible to use a DHCP server.*

ACTIVATING THE EXTENDED BACKGROUND SCANNING AND IP ROUTER MODE

To apply the „Extended Background Scanning and IP Router" mode to the WLAN Client, the operation mode has to be changed accordingly under „**Configuration → IP Configuration**".

Here it has to be observed that NAT is activated at the WLAN-1 interface if a „**Disguise**" is desired. Otherwise, correct routes have to be provided in the whole wireless network.



IP configuration

Operational mode: Extended Background Scanning & IP router

Important: If the operational mode is changed all currently active filter rulesets and portforwardings will be disabled.
You will have to check your rulesets and possibly re-enable them.
Also, it is possible that not all prioritisation classes can be applied for the new operational mode. You can check which classes are active at the prioritisation page of each interface.

WLAN-1:

IP assignment:	static
IP address:	10.0.0.1
Subnet mask:	255.255.255.0

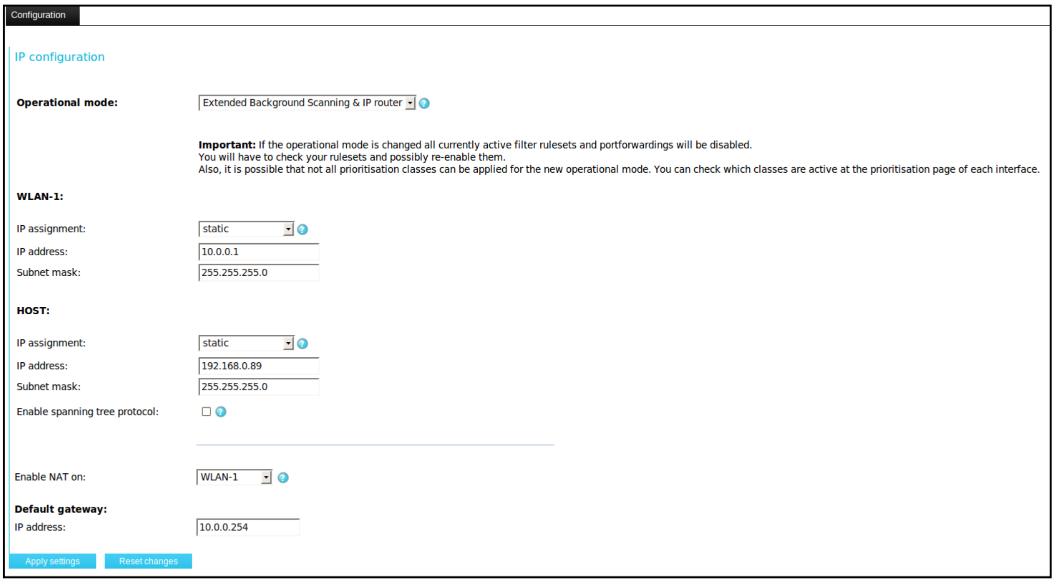
HOST:

IP assignment:	static
IP address:	192.168.0.89
Subnet mask:	255.255.255.0
Enable spanning tree protocol:	☐

Enable NAT on:	WLAN-1

Default gateway:

IP address:	10.0.0.254



IP configuration

Operational mode: Extended Background Scanning & IP router

Important: If the operational mode is changed all currently active filter rulesets and portforwardings will be disabled.
You will have to check your rulesets and possibly re-enable them.
Also, it is possible that not all prioritisation classes can be applied for the new operational mode. You can check which classes are active at the prioritisation page of each interface.

WLAN-1:

IP assignment: static
IP address: 10.0.0.1
Subnet mask: 255.255.255.0

HOST:

IP assignment: static
IP address: 192.168.0.89
Subnet mask: 255.255.255.0
Enable spanning tree protocol: □

Enable NAT on: WLAN-1

Default gateway:
IP address: 10.0.0.254

Note:
Once the device is operated in this mode, the configuration pages for the second WLAN interface will be inactive.

Note:
Neighbour roaming is activated for both WLAN interfaces; this will also be maintained after deactivation of the operation mode.

CONFIGURATION OF WLAN INTERFACE(S)

Further configuration of the WLAN interface is carried out as usual under

- **Configuration → WLAN-1 Parameters**
- **Configuration → WLAN-1 Security**
- **Configuration → Adv. WLAN → Roaming WLAN-1.**

Here only the WLAN-1 interface can be configured. The settings are automatically applied to the second interface.

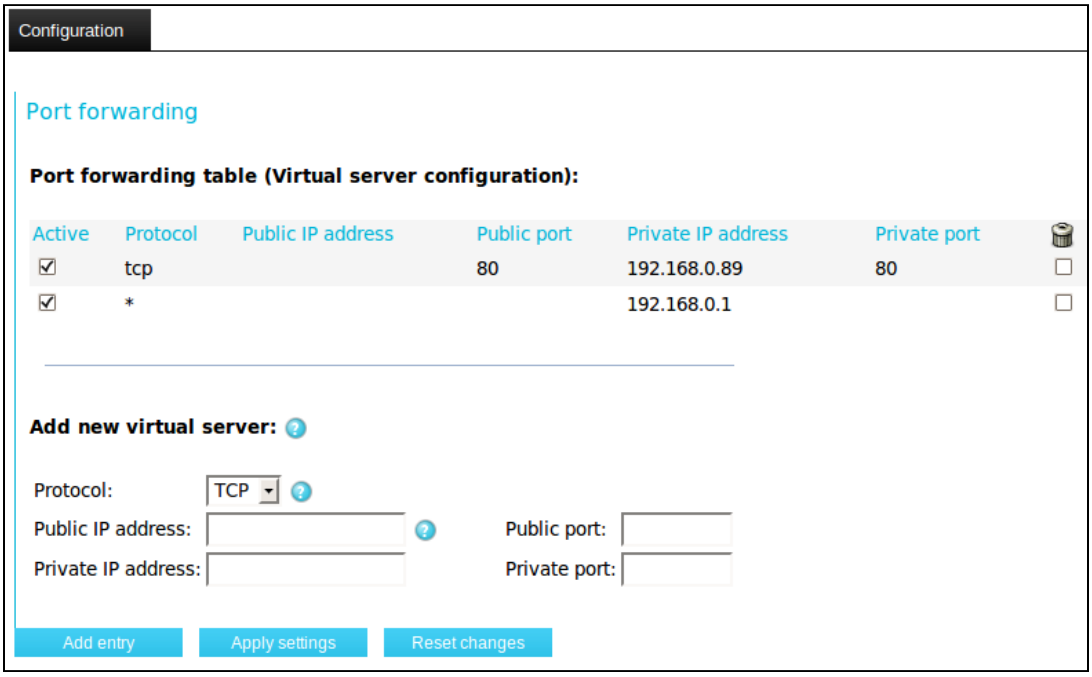
Note:
The antenna settings can be made for both WLAN interfaces on the respective pages.

Configuration of Port Forwarding

Under Configuration → Network → Port Forwarding, rules can be defined for forwarding the inbound Ethernet packets. Thus it is possible to directly address the „**disguised**" terminal from the WLAN network (10.0.0.0) without knowing its IP address.

The first rule is to redirect all http enquiries (Port 80) to the WLAN Client itself; thus its web interface can be addressed in the usual way.

Only the second rule forwards all residual packets (TCP and UDP) of all the other ports to the terminal (192.168.0.1).



Port forwarding

Port forwarding table (Virtual server configuration):

Active	Protocol	Public IP address	Public port	Private IP address	Private port	
☑	tcp		80	192.168.0.89	80	□
☑	*			192.168.0.1		□

Add new virtual server:

Protocol: TCP

Public IP address: Public port:

Private IP address: Private port:

Note:
With these settings, it is not possible to access a web server at the terminal. If this is required, the first rule has to be removed.

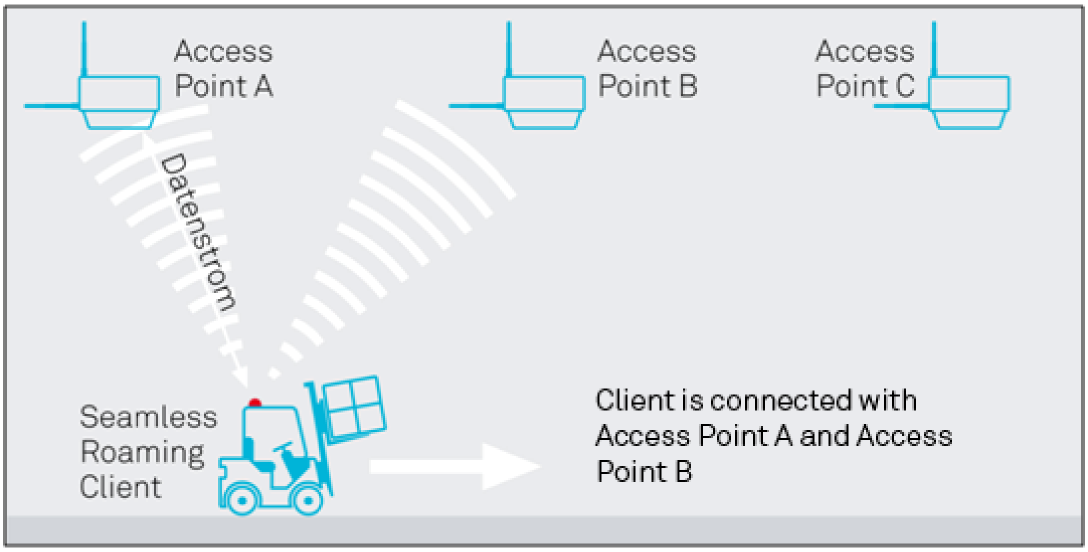
12.7 Seamless Roaming

General

The aim of Seamless Roaming is to manage the roaming process without packet losses. Only Dual WLAN devices may suit this purpose because they are provided with two WLAN interfaces. These two interfaces have an identical configuration. While one interface takes over data communication, as known from the normal WLAN, the second interface tries to find a connection of higher signal strength. By means of this functionality, it is possible to setup complex networks with several Access Points where the Client can move relatively freely without causing packet losses due to roaming.

The configuration of a Seamless Roaming Client differs only slightly from the configuration of a normal WLAN Client. The configuration of the Access Points does not differ from the configuration of other Access Points and is therefore not explained here.

➔ ***Note:***
To use its Seamless Roaming functionality, the RAC112 requires devices of the RAP product series from version 3.1.



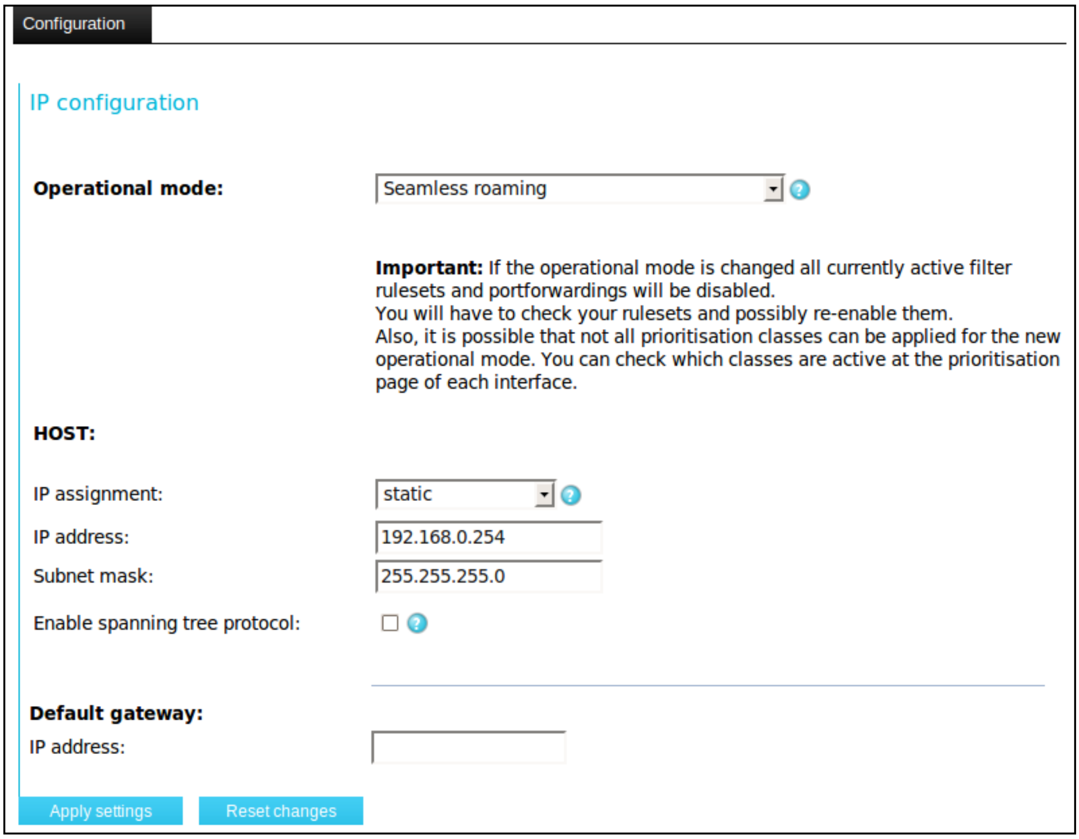
Configuration of the Seamless Roaming Mode

Basic configuration

To configure the device for the Seamless Roaming mode, the operation mode has to be changed to **Seamless Roaming** under „**Configuration → IP Configuration**".

➔ ***Note:***
Once the device is operated in the Seamless Roaming mode, the configuration pages for the second WLAN interface will be inactive.

➔ ***Note:***
Neighbour roaming is deactivated for both WLAN interfaces; this status will also be maintained after deactivation of the Seamless Roaming mode.



IP configuration

Operational mode: Seamless roaming

Important: If the operational mode is changed all currently active filter rulesets and portforwardings will be disabled.
You will have to check your rulesets and possibly re-enable them.
Also, it is possible that not all prioritisation classes can be applied for the new operational mode. You can check which classes are active at the prioritisation page of each interface.

HOST:

IP assignment: static

IP address: 192.168.0.254

Subnet mask: 255.255.255.0

Enable spanning tree protocol: ☐

Default gateway:

IP address:

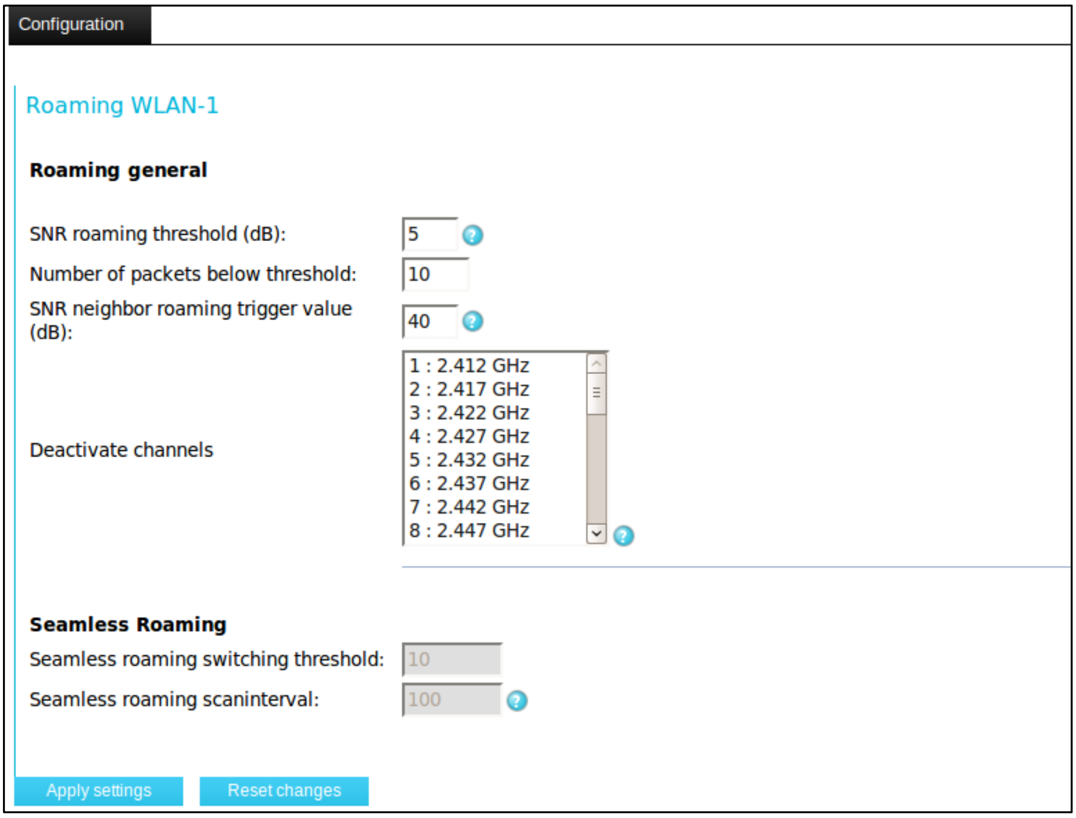
CONFIGURATION OF THE WLAN INTERFACE

Further configuration of the WLAN interface is carried out as usual under

- **Configuration → WLAN-1 Parameters**
- **Configuration → WLAN-1 Security**
- **Configuration → Adv. WLAN** /.

Here only the WLAN-1 interface can be configured. The settings are automatically applied to the second interface.

Note:
The antenna settings can further be made for both WLAN interfaces on the respective pages.



Roaming WLAN-1

Roaming general

SNR roaming threshold (dB): 5

Number of packets below threshold: 10

SNR neighbor roaming trigger value (dB): 40

Deactivate channels:
1 : 2.412 GHz
2 : 2.417 GHz
3 : 2.422 GHz
4 : 2.427 GHz
5 : 2.432 GHz
6 : 2.437 GHz
7 : 2.442 GHz
8 : 2.447 GHz

Seamless Roaming

Seamless roaming switching threshold: 10

Seamless roaming scaninterval: 100

Configuration of the Seamless Roaming Behaviour

The change threshold for Seamless Roaming is entered under „**Configuration → Adv. WLAN → Roaming WLAN-1**". This threshold indicates when a connection quality of a WLAN interface is preferred to the connection quality of the other interface.

Example:

Both interfaces are configured and currently registered at an Access Point.

Connection quality of WLAN-1: 23 dB
Connection quality of WLAN-2: 38 dB

The device can recognise the second interface as the „better one" only if the Seamless Roaming change threshold is smaller than 15dB.

Deactivating the Seamless Roaming Mode

The operation mode can again be changed under „**Configuration → IP Configuration**" (Standard Transparent Bridge).

> ***Note:***
> *After this adaption, the settings of the WLAN-1 interface are maintained. The second WLAN interface is again configured as before activation of the Seamless Roaming mode.*

Influence of the Extended Roaming Parameters

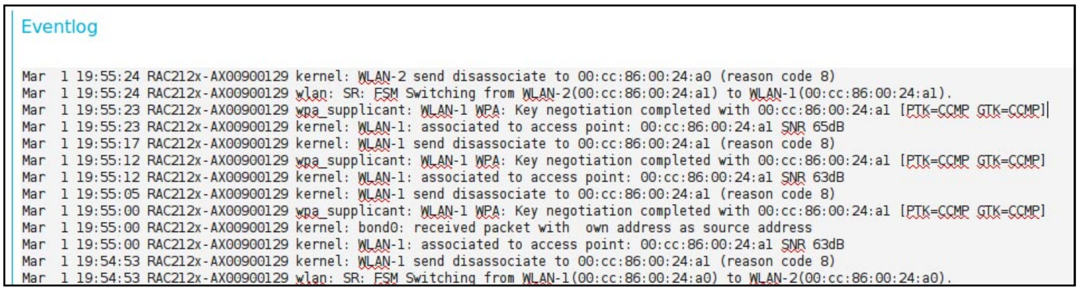
The Extended Roaming Parameters are configured under „**Configuration** → **Adv. WLAN** → **Roaming WLAN-1**".

Neighbour Roaming is deactivated in the Seamless Roaming mode. The two other roaming parameters can be applied.

The scanning process of the two interfaces can be shortened via the Restricted Channel List. The two boxes „**SNR Roaming Threshold**" and „**Packet Number below Threshold**" can be used to identify worsening connections. Here however it must be considered that the parameters only refer to the passive interfaces so that the active data connection is not adversely affected.

Status Output in Seamless Roaming

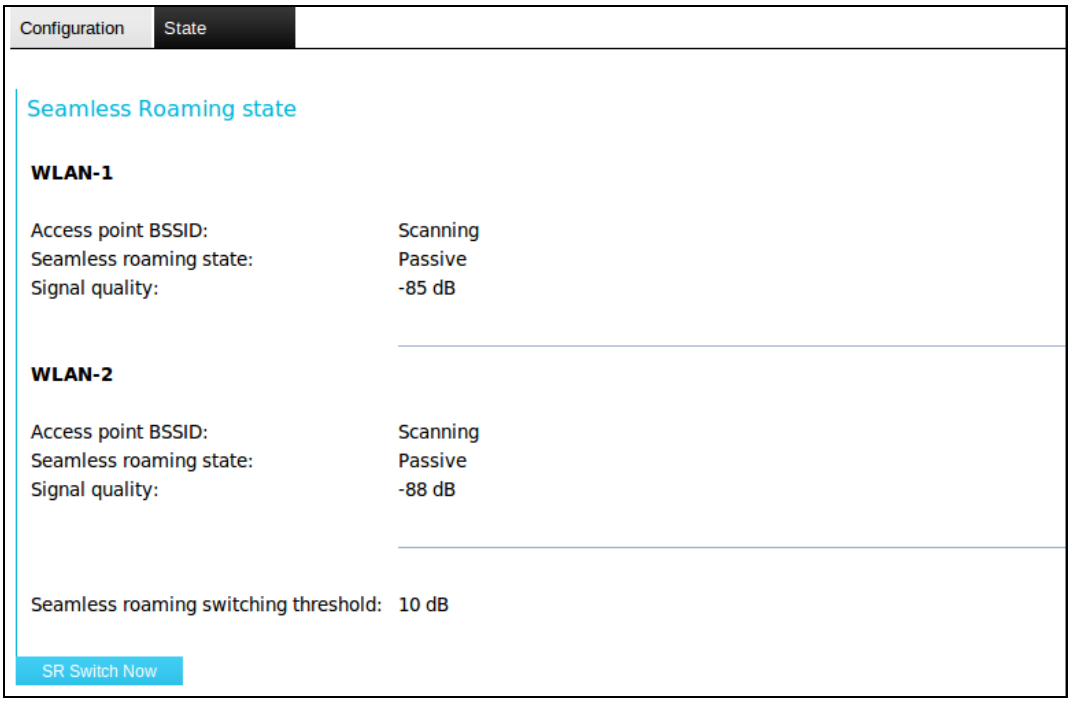
In addition to the known status messages, other seamless roaming specific messages are displayed in the Event log. If a "better" connection is found, the message „**Switch from WLAN-1 to WLAN-2**" appears. Further, the interface searching for better connections permanently produces status messages and WPA messages, if any. **This is no malfunction.**



Eventlog

```
Mar  1 19:55:24 RAC212x-AX00900129 kernel: WLAN-2 send disassociate to 00:cc:86:00:24:a0 (reason code 8)
Mar  1 19:55:24 RAC212x-AX00900129 wlan: SR: FSM Switching from WLAN-2(00:cc:86:00:24:a1) to WLAN-1(00:cc:86:00:24:a1).
Mar  1 19:55:23 RAC212x-AX00900129 wpa_supplicant: WLAN-1 WPA: Key negotiation completed with 00:cc:86:00:24:a1 [PTK=CCMP GTK=CCMP]
Mar  1 19:55:23 RAC212x-AX00900129 kernel: WLAN-1: associated to access point: 00:cc:86:00:24:a1 SNR 65dB
Mar  1 19:55:17 RAC212x-AX00900129 kernel: WLAN-1 send disassociate to 00:cc:86:00:24:a1 (reason code 8)
Mar  1 19:55:12 RAC212x-AX00900129 wpa_supplicant: WLAN-1 WPA: Key negotiation completed with 00:cc:86:00:24:a1 [PTK=CCMP GTK=CCMP]
Mar  1 19:55:12 RAC212x-AX00900129 kernel: WLAN-1: associated to access point: 00:cc:86:00:24:a1 SNR 63dB
Mar  1 19:55:05 RAC212x-AX00900129 kernel: WLAN-1 send disassociate to 00:cc:86:00:24:a1 (reason code 8)
Mar  1 19:55:00 RAC212x-AX00900129 wpa_supplicant: WLAN-1 WPA: Key negotiation completed with 00:cc:86:00:24:a1 [PTK=CCMP GTK=CCMP]
Mar  1 19:55:00 RAC212x-AX00900129 kernel: bond0: received packet with  own address as source address
Mar  1 19:55:00 RAC212x-AX00900129 kernel: WLAN-1: associated to access point: 00:cc:86:00:24:a1 SNR 63dB
Mar  1 19:54:53 RAC212x-AX00900129 kernel: WLAN-1 send disassociate to 00:cc:86:00:24:a1 (reason code 8)
Mar  1 19:54:53 RAC212x-AX00900129 wlan: SR: FSM Switching from WLAN-1(00:cc:86:00:24:a0) to WLAN-2(00:cc:86:00:24:a0).
```

On the WLAN diagnosis page is displayed whether the interface is just transferring data (seamless roaming status active) or whether the interface is searching for better connections (passive). The scan results of both interfaces may be different since it has to be prevented that the two interfaces select the same Access Point. Therefore it is possible that the passive interface does not see the Access Point of the active one and vice versa.



Seamless Roaming state

WLAN-1

Access point BSSID:	Scanning
Seamless roaming state:	Passive
Signal quality:	-85 dB

WLAN-2

Access point BSSID:	Scanning
Seamless roaming state:	Passive
Signal quality:	-88 dB

Seamless roaming switching threshold: 10 dB

12.8 Extended Background Scanning

General

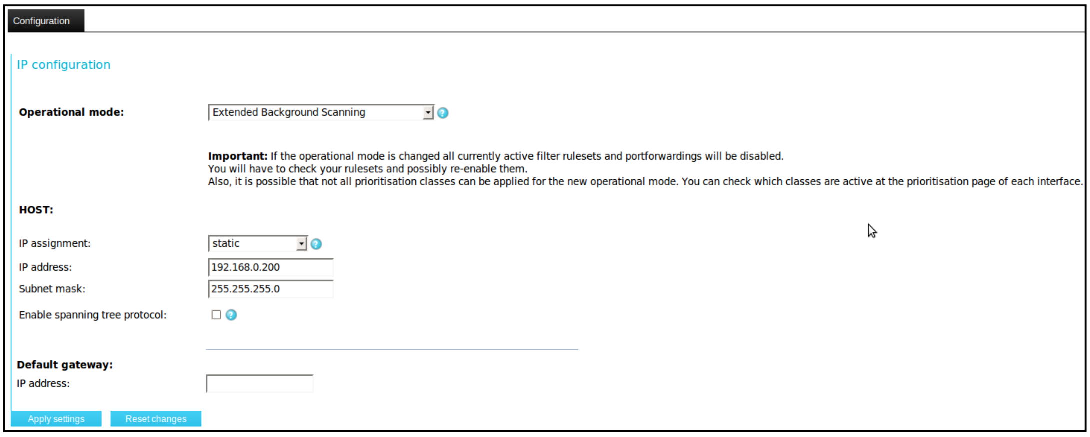
The aim of Extended Background Scanning is to realise the roaming process without losing time during scanning. For this purpose two WLAN interfaces are needed. Therefore, only the RAC112 is suited because it is the only Client that has two WLAN interfaces. These two interfaces are configured identically. While one interface is for data communication, as known of the normal WLAN, the second interface permanently scans and provides this new information to the first interface. Due to this information and the threshold for Neighbour Roaming, the first interface can evaluate new Access Points and, if required, roam to them. In doing so, there is not time needed for scanning because the channel and the address of the better Access Point are known.

The configuration of the Extended Background Scanning Client differs only slightly from the configuration of a normal WLAN Client. The configuration of the Access Points does not differ from the configuration of other Access Points and will therefore not be explained here.

Configuration

Activating the Extended Background Scanning Mode

To configure the RAC112 for the Extended Background Scanning Mode, the operation mode has to be changed to Extended Background Scanning under „**Configuration → IP Configuration**".



Operational mode: Extended Background Scanning

Important: If the operational mode is changed all currently active filter rulesets and portforwardings will be disabled.
You will have to check your rulesets and possibly re-enable them.
Also, it is possible that not all prioritisation classes can be applied for the new operational mode. You can check which classes are active at the prioritisation page of each interface.

HOST:

IP assignment: static
IP address: 192.168.0.200
Subnet mask: 255.255.255.0
Enable spanning tree protocol: □

Default gateway:
IP address:

Note:
Once the RAC112 is operated in the Extended Background Scanning mode, the configuration pages for the second WLAN interface will be inactive.

Note:
Neighbour Roaming is activated for the two WLAN interfaces; this will also be maintained after deactivation of the Extended Background Scanning Mode.

Configuration of WLAN Interface(s)

Further configuration of the WLAN interface is performed as usual under

Configuration → WLAN-1 Parameters
Configuration → WLAN-1 Security
Configuration → Adv. WLAN /.

Here the WLAN-1 interface can be configured only. The settings are automatically applied to the second interface.

➔ ***Note:***
The antenna settings can be made for both WLAN interfaces on the respective pages.

Extended Configuration of Extended Background Scanning

The change threshold for Extended Background Scanning is entered under „**Configuration → Adv. WLAN → Roaming WLAN-1**". This threshold indicates when a connection quality of a WLAN interface is preferred to the connection quality of the other interface. Here the same threshold is used as for the Neighbour Roaming functions.

Example:

Both interfaces are configured and currently registered at an Access Point.

Connection quality of WLAN-1: 23 dB
Connection quality of WLAN-2: 38 dB

The RAC112 can recognise the second interface as the „better one" only if the SNR distance is smaller than 15. But it must not be deactivated (set to zero), as shown in the figure 5dB.

Influence of Extended Roaming Parameters

The Extended Roaming parameters are set under „**Configuration → Adv. WLAN → Roaming WLAN-1**".

The Neighbour Roaming must be activated in the Extended Background Scanning Mode on an RAC112. The two other roaming parameters can however be applied for further improvement of roaming. The scanning process of the two interfaces can be shortened by means of the Restricted Channel List. The two boxes „SNR Roaming Threshold" and „Packet Number below Threshold" can be used to identify worsening connections. Here however it must be considered that the parameters refer to both interfaces and if those are selected by mistake, this may also adversely affect the active data connection.

Status Output in Extended Background Scanning Mode

If the active interface of the scanning interface has found a better Access Point, the following message appears in the Event Log:

```
„WLAN-1: found better access point: 00:11:22:33:44:55 on channel
10“
```

Deactivating the Extended Background Scanning Mode

The operation mode can again be changed under Configuration → IP Configuration“ (Standard Transparent Bridge).

> ***Note:***
> *After this adaption the settings of the WLAN-1 interface are maintained. The second WLAN interface is again configured as before activation of the Extended Background Scanning mode.*

12.9 EXTENDED ROAMING PARAMETERS

GENERAL

Roaming is always required if a Client moves in a large area which cannot be covered by only one Access Point. Compared to radio links or point-to-point connections mostly having a fixed channel option, roaming setups require that the Clients are able to find the various Access Points on the different channels.

Basically, there are two decisive parameters for roaming:

- **When**

and

- **Whereto**

First, the Client must know or decide at what time he gives up an existing connection to look for a better one. Secondly, an additional question arises where to find such a better Access Point.

As regards the first question, the following parameters are considered and explained under „Roaming Threshold‟:
Connection quality
Period of time

In addition to this „active‟ roaming, the Client can also evaluate permanent information which is already contained in the air of other networks. This is dealt with in the chapter „Neighbour Roaming‟.

The second question „Whereto‟ most strongly determines the duration of a connection failure. If the Client must first rescan all channels, this takes a long time. Therefore, the Clients offer the possibility of restricting the channel list; see „Restricted Channel List‟.

Configuration of the WLAN interface is carried out as usual under

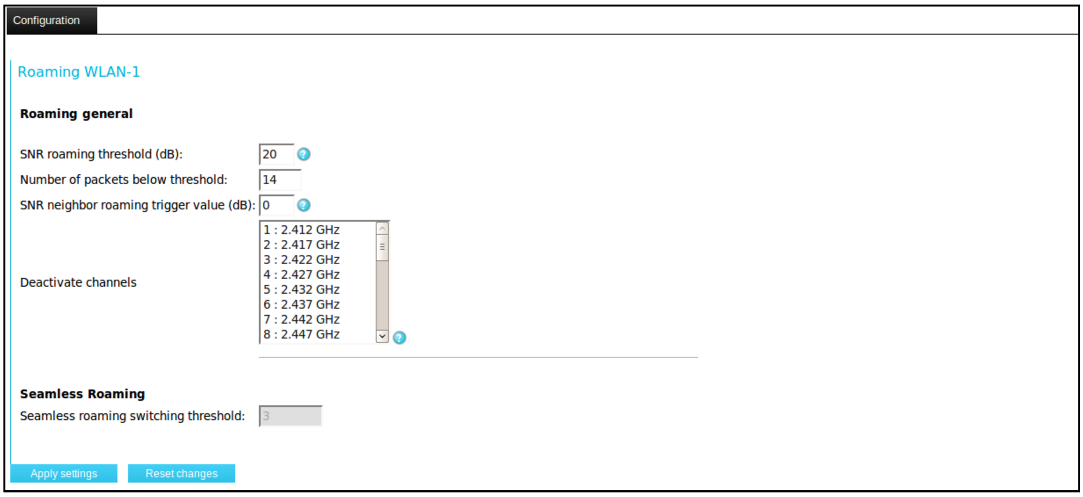
- **Configuration → WLAN-1 Parameters**
- **Configuration → WLAN-1 Security**
- **Configuration → Adv. WLAN** /.

Then the roaming parameters can be specified in more detail, as explained in the following chapters.

CONFIGURATION

Roaming Threshold

To allow a Client to roam to an Access Point already before a connection is lost, the parameters „**SNR-Roaming Threshold**‟ and „**Packet Number below Threshold**‟ can be adapted.



Roaming WLAN-1

Roaming general

SNR roaming threshold (dB): 20

Number of packets below threshold: 14

SNR neighbor roaming trigger value (dB): 0

Deactivate channels
1 : 2.412 GHz
2 : 2.417 GHz
3 : 2.422 GHz
4 : 2.427 GHz
5 : 2.432 GHz
6 : 2.437 GHz
7 : 2.442 GHz
8 : 2.447 GHz

Seamless Roaming

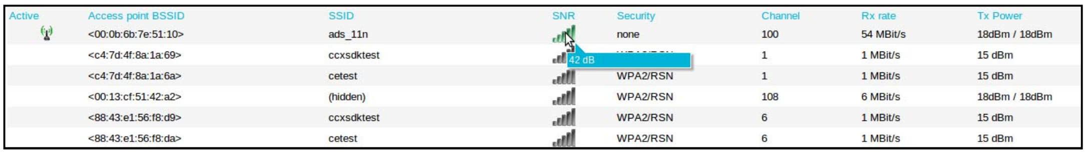
Seamless roaming switching threshold: 3

The threshold indicates the lower limit from which a connection is considered to be „bad‟. The packet number indicates how many “bad” connections, i.e. below threshold, must be given to roam the packets.

Example process of configuration

Measuring the signal strengths:

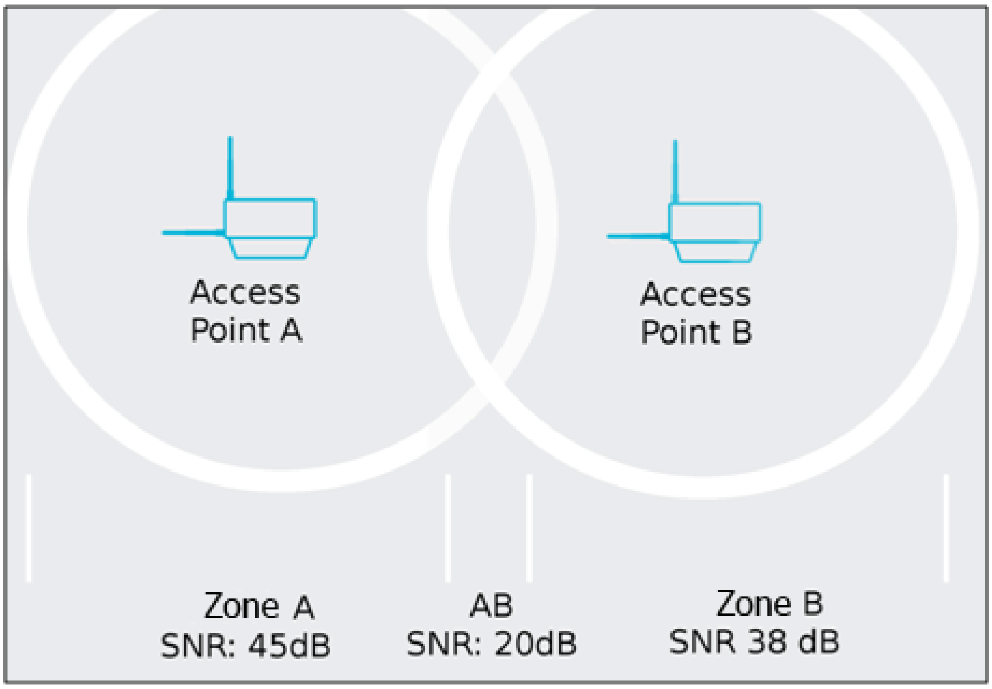
After fixed installation of the Access Points, the current SNR values (Signal Noise Ratio) can be viewed in the web interface under „**Diagnosis → WLAN1 Parameters**‟. Now the signal strengths to the Access Points should be measured on the whole area. At least the points in the direct vicinity of the Access Points and between one or more Access Points should be recorded.



Active	Access point BSSID	SSID	SNR	Security	Channel	Rx rate	Tx Power
📶	<00:0b:6b:7e:51:10>	ads_11n		none	100	54 MBit/s	18dBm / 18dBm
	<c4:7d:4f:8a:1a:69>	ccxsdktest	42 dB	WPA2/RSN	1	1 MBit/s	15 dBm
	<c4:7d:4f:8a:1a:6a>	cetest		WPA2/RSN	1	1 MBit/s	15 dBm
	<00:13:cf:51:42:a2>	(hidden)		WPA2/RSN	108	6 MBit/s	18dBm / 18dBm
	<88:43:e1:56:f8:d9>	ccxsdktest		WPA2/RSN	6	1 MBit/s	15 dBm
	<88:43:e1:56:f8:da>	cetest		WPA2/RSN	6	1 MBit/s	15 dBm

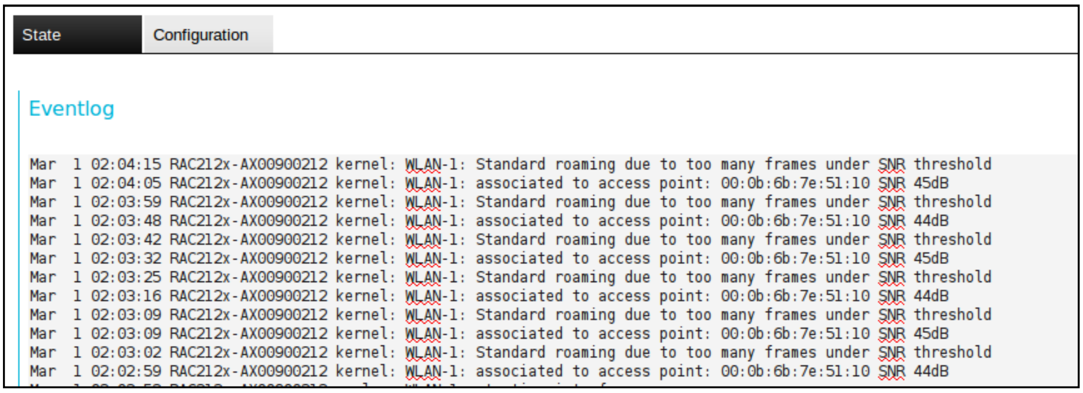
Determination of the threshold:

The threshold should be chosen slightly below the lowest threshold value measured between all Access Points. It must never be higher than the signal strength measured directly at the Access Points. The signal strengths, shown in the figure below, are rather (45 and 38 dB) in the areas A and B. In the overlapping area AB, the signal strength is 20dB; therefore the threshold chosen should be 20dB so that the Client roams at lower signal strengths.



Setting of parameters:

It is recommended to keep the packet number fixed (e.g. 15) and first to adjust the threshold (in the example: 15); then the packet number can be decreased if the dwell time is too long, or be increased in case of excessive roaming. If the roaming triggers are activated, the following messages are displayed in the Client's Event Log:



```
Mar  1 02:04:15 RAC212x-AX00900212 kernel: WLAN-1: Standard roaming due to too many frames under SNR threshold
Mar  1 02:04:05 RAC212x-AX00900212 kernel: WLAN-1: associated to access point: 00:0b:6b:7e:51:10 SNR 45dB
Mar  1 02:03:59 RAC212x-AX00900212 kernel: WLAN-1: Standard roaming due to too many frames under SNR threshold
Mar  1 02:03:48 RAC212x-AX00900212 kernel: WLAN-1: associated to access point: 00:0b:6b:7e:51:10 SNR 44dB
Mar  1 02:03:42 RAC212x-AX00900212 kernel: WLAN-1: Standard roaming due to too many frames under SNR threshold
Mar  1 02:03:32 RAC212x-AX00900212 kernel: WLAN-1: associated to access point: 00:0b:6b:7e:51:10 SNR 45dB
Mar  1 02:03:25 RAC212x-AX00900212 kernel: WLAN-1: Standard roaming due to too many frames under SNR threshold
Mar  1 02:03:16 RAC212x-AX00900212 kernel: WLAN-1: associated to access point: 00:0b:6b:7e:51:10 SNR 44dB
Mar  1 02:03:09 RAC212x-AX00900212 kernel: WLAN-1: Standard roaming due to too many frames under SNR threshold
Mar  1 02:03:09 RAC212x-AX00900212 kernel: WLAN-1: associated to access point: 00:0b:6b:7e:51:10 SNR 45dB
Mar  1 02:03:02 RAC212x-AX00900212 kernel: WLAN-1: Standard roaming due to too many frames under SNR threshold
Mar  1 02:02:59 RAC212x-AX00900212 kernel: WLAN-1: associated to access point: 00:0b:6b:7e:51:10 SNR 44dB
```

Causes of error:

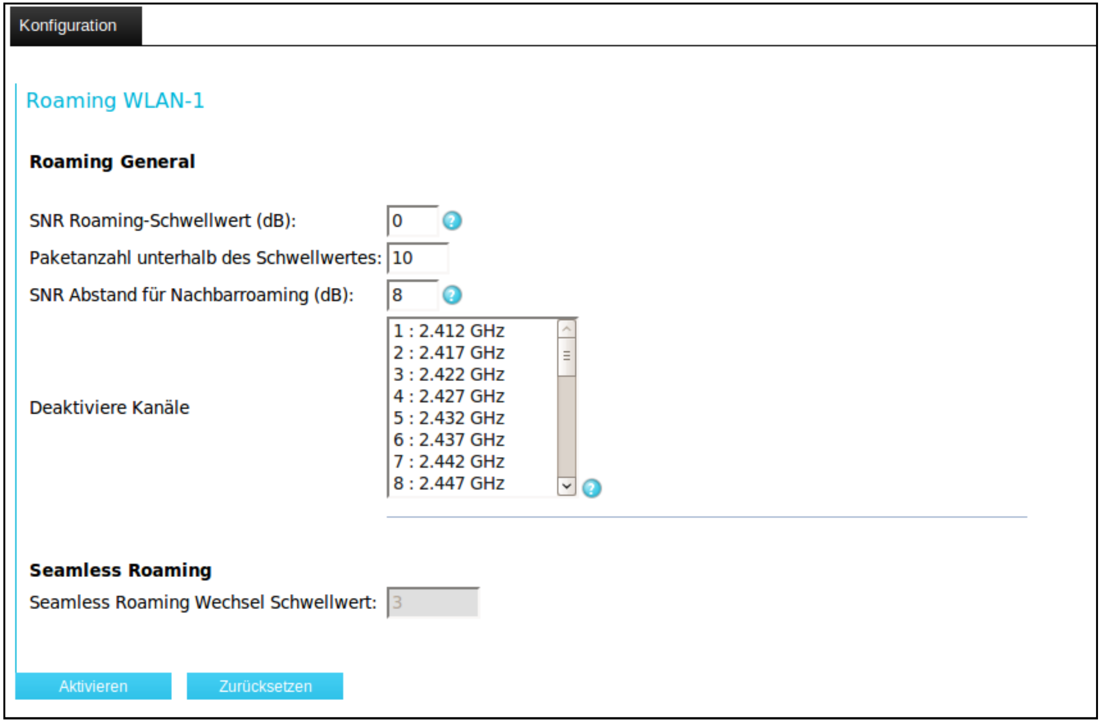
An excessively high number of roaming messages within an excessively short time in the Client's Event Log suggest that the chosen threshold is too high or the chosen packet number is too low.

Compared to that, an excessively high dwell time at the Access Points suggests that the threshold is too low or the packet number is too high.

> ***Note:***
> *If the threshold is „0", this function is deactivated.*

> ***Note:***
> *According to empirical values, good results are achieved with values from 10 to 25 packets for a „Packet Number below Threshold" and values from 15-25 dB for the „Threshold".*

Neighbour Roaming:
The „**SNR Distance**" for Neighbour Roaming can be entered under „**Configuration → Adv. WLAN → Roaming WLAN**". This threshold indicates when a connection quality of an Access Point to a directly neighbouring channel is to be preferred to the connection quality of the current Access Point.



Roaming WLAN-1

Roaming General

SNR Roaming-Schwellwert (dB): 0

Paketanzahl unterhalb des Schwellwertes: 10

SNR Abstand für Nachbarroaming (dB): 8

Deaktiviere Kanäle:
1 : 2.412 GHz
2 : 2.417 GHz
3 : 2.422 GHz
4 : 2.427 GHz
5 : 2.432 GHz
6 : 2.437 GHz
7 : 2.442 GHz
8 : 2.447 GHz

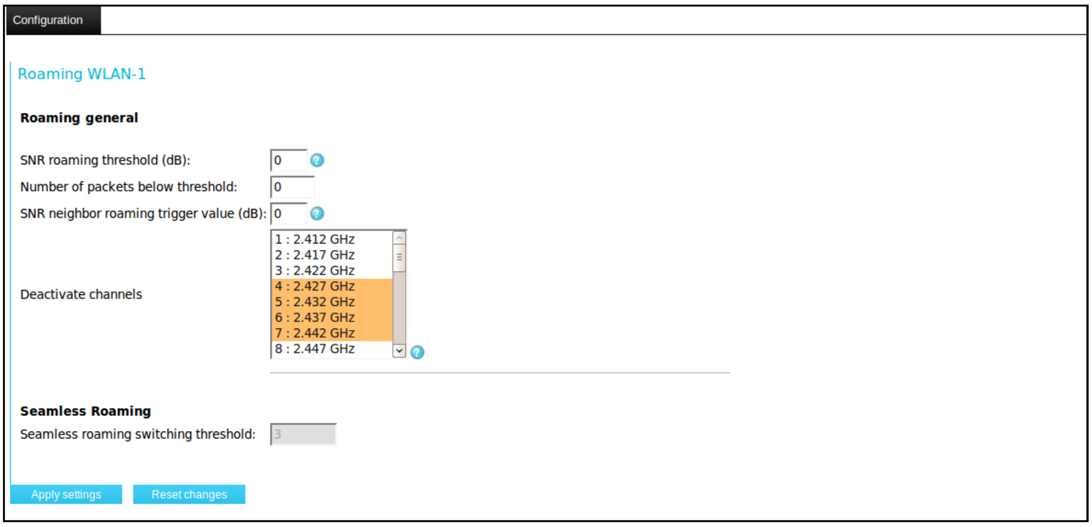
Seamless Roaming

Seamless Roaming Wechsel Schwellwert: 3

> ***Note:***
> *Neighbour Roaming is deactivated if the SNR distance is „0".*

RESTRICTED CHANNEL LIST

The channels checked by a Client for Access Points can be restricted under „**Configuration → Adv. WLAN → Roaming WLAN**". A selection for this purpose can be made by pressing the left mouse button and simultaneously the Control or Shift keys. The selected channels are then not used by the Client because they are deactivated.



Roaming WLAN-1

Roaming general

SNR roaming threshold (dB): 0

Number of packets below threshold: 0

SNR neighbor roaming trigger value (dB): 0

Deactivate channels

- 1 : 2.412 GHz
- 2 : 2.417 GHz
- 3 : 2.422 GHz
- 4 : 2.427 GHz
- 5 : 2.432 GHz
- 6 : 2.437 GHz
- 7 : 2.442 GHz
- 8 : 2.447 GHz

Seamless Roaming

Seamless roaming switching threshold: 3

➔

Note:

If all channels are selected, the Client will find no Access Point.

12.1 Remote Capture

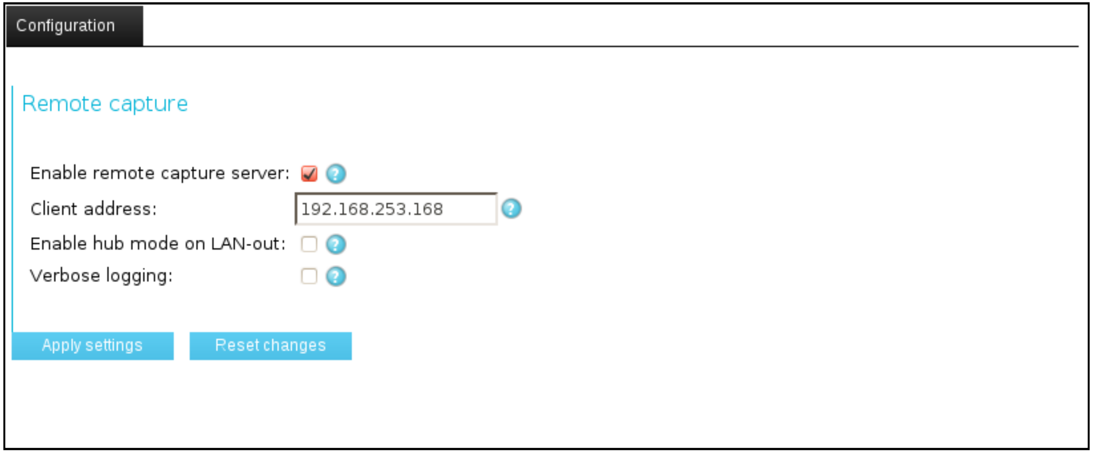
General

With Remote Capture, the traffic of any active device interface can be recorded and analysed via the network by a Windows computer with Wireshark (**http://www.wireshark.org**).

> ***Note:***
> *This feature is only designed for debugging. Since authentication is not possible, the Capture Server may only be activated in case of need for a short time for diagnosis purposes in order to minimize the security risk.*

Configuration

The Remote Capture Service is activated under Diagnosis/Remote Capture and then listens to inbound connections on the standard port 2002. Since authentication is not possible, the IP address of the recording computer must explicitly be given (e.g. 192.168.253.168) in order to minimize the security risk:



Remote capture

Enable remote capture server: ☑

Client address: 192.168.253.168

Enable hub mode on LAN-out: □

Verbose logging: □

Another precaution is to establish only one connection at a time, i.e. the given computer cannot make two records at the same time.

LAN-out normally works as switch. That means, if two devices talk with each other (e.g. on Port 1 and Port 2), the packets are forwarded within the switch and hardware, i.e. they do not reach the device systems and thus cannot be recorded. To make the whole traffic between the ports transparent, if required, the option „Activate Hub Mode for LAN-out" is used. In the Hub mode all packets are forwarded to all ports and also to the device system.

Normally, access violations are also logged (connection build-up of a wrong IP address or second trial to establish a connection). Information on the connection (control/data channel) and bugged ports are also recorded with detailed messages.

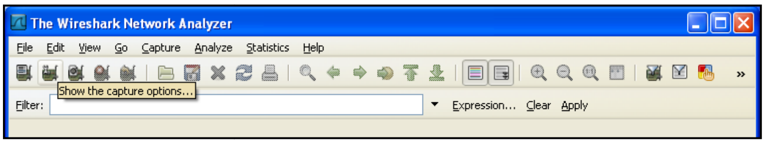
Note:

To prevent that the service is activated unknowingly by mistake, an hourly warning will be issued in the Event Log.
To ensure a useful recording, the Remote Capture connection between the device and the recording computer is basically filtered.
The Hub mode needs approximately 10 seconds to become active. So if a Remote Capture Service is activated too fast, it is possible that the first packets are not visible in the record.

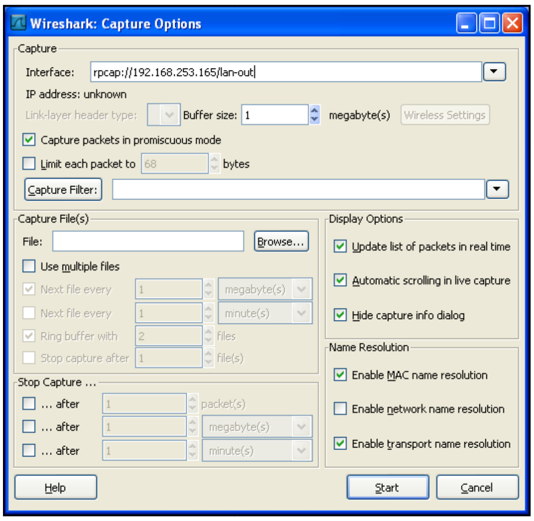
CONFIGURATION OF WIRESHARK UNDER WINDOWS XP

The minimum requirement is Wireshark in the version 1.0.6 and WinPcap in the version 4.0.2. In former versions it was not possible to stop or restart recording.

Remote interfaces must explicitly be indicated under Show Capture Options (second icon in the main tools list) or in the menu under Capture/Options:



To record, for example, the traffic on the LAN-out of the device with IP address 192.168.253.165, the Remote Capture URL is: rpcap://192.168.253.165/LAN-out:



Wireshark: Capture Options

Capture

Interface: rpcap://192.168.253.165/lan-out

IP address: unknown

Link-layer header type: Buffer size: 1 megabyte(s) Wireless Settings

☑ Capture packets in promiscuous mode

☐ Limit each packet to 68 bytes

Capture Filter:

Capture File(s)

File: Browse...

☐ Use multiple files

☑ Next file every 1 megabyte(s)

☐ Next file every 1 minute(s)

☑ Ring buffer with 2 files

☐ Stop capture after 1 file(s)

Display Options

☑ Update list of packets in real time

☑ Automatic scrolling in live capture

☑ Hide capture info dialog

Name Resolution

☑ Enable MAC name resolution

☐ Enable network name resolution

☑ Enable transport name resolution

Stop Capture ...

☐ ... after 1 packet(s)

☐ ... after 1 megabyte(s)

☐ ... after 1 minute(s)

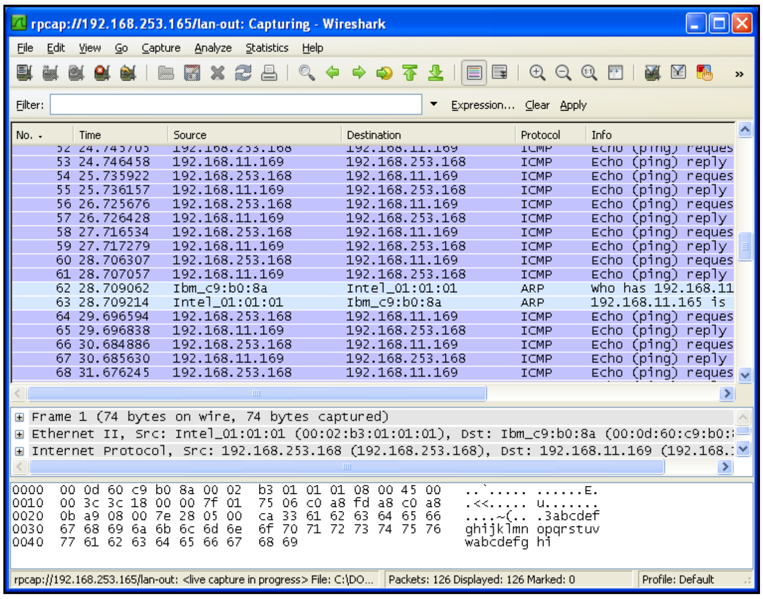
Help Start Cancel

The prefix rpcap:// must always be indicated; it marks the record per network. The interfaces of the device are given according to their names used in the web interface without case sensitivity. Exceptions are IPsec interfaces – there the space character in front of the IPsec must be dropped. In detail, the following designations are possible:

Interface	**Remark**
DSL	DSL uplink (independent of the underlying interface through which the connection was established)
LAN-in	Does always exist
LAN-out	Does always exist
LAN-out-x	The individual ports (x is replaced by 1,2,3 or 4) only exist in the extended IP router mode. LAN-out is then the internal end point for layer 2 OpenVPN connections.
SERVICE	Does exist if there is a modem connection.
L2-VPNx	The individual OpenVPN interfaces (x is replaced by 1 to 10) always exist in case of master connections and in case of Client connections only if the Client is really connected.

LAN-in(IPsec)
LAN(IPsec)
LAN-out-1(IPsec)
LAN-out-2(IPsec)
LAN-out-3(IPsec)
LAN-out-4(IPsec)
SERVICE(IPsec)
	According to the IPsec configuration, there is s specific IPsec interface for the tunnel end point (e.g. LAN-in(IPsec), where the traffic is visible unencrypted. At the underlying interface (e.g. LAN-in) only the encrypted packets are visible. LAN(IPsec) belongs to the tunnel end point for LAN-out.

If the connection is established successfully, the packets can be normally viewed and filtered under Wireshark:

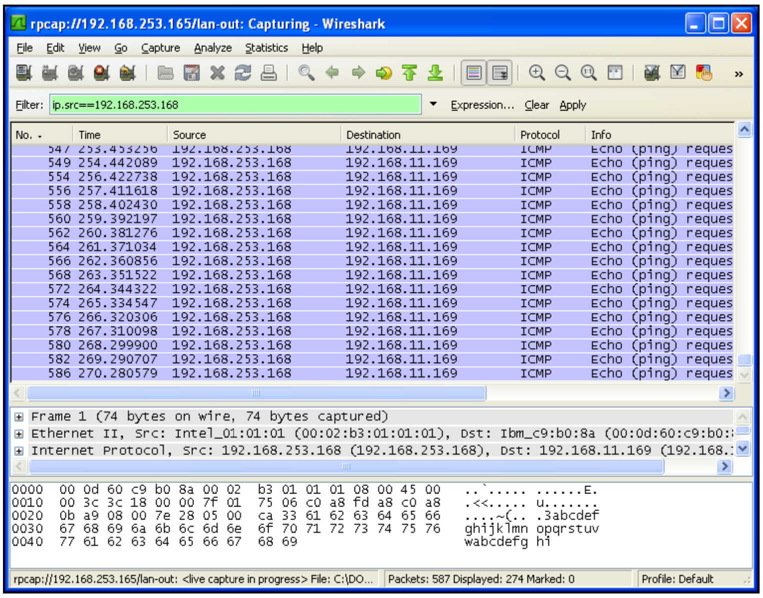


```
No. -  Time        Source            Destination       Protocol  Info
   52 24.745705   192.168.253.168   192.168.11.169    ICMP      Echo (ping) reques
   53 24.746458   192.168.11.169    192.168.253.168   ICMP      Echo (ping) reply
   54 25.735922   192.168.253.168   192.168.11.169    ICMP      Echo (ping) reques
   55 25.736157   192.168.11.169    192.168.253.168   ICMP      Echo (ping) reply
   56 26.725676   192.168.253.168   192.168.11.169    ICMP      Echo (ping) reques
   57 26.726428   192.168.11.169    192.168.253.168   ICMP      Echo (ping) reply
   58 27.716534   192.168.253.168   192.168.11.169    ICMP      Echo (ping) reques
   59 27.717279   192.168.11.169    192.168.253.168   ICMP      Echo (ping) reply
   60 28.706307   192.168.253.168   192.168.11.169    ICMP      Echo (ping) reques
   61 28.707057   192.168.11.169    192.168.253.168   ICMP      Echo (ping) reply
   62 28.709062   Ibm_c9:b0:8a      Intel_01:01:01    ARP       Who has 192.168.11
   63 28.709214   Intel_01:01:01    Ibm_c9:b0:8a      ARP       192.168.11.165 is
   64 29.696594   192.168.253.168   192.168.11.169    ICMP      Echo (ping) reques
   65 29.696838   192.168.11.169    192.168.253.168   ICMP      Echo (ping) reply
   66 30.684886   192.168.253.168   192.168.11.169    ICMP      Echo (ping) reques
   67 30.685630   192.168.11.169    192.168.253.168   ICMP      Echo (ping) reply
   68 31.676245   192.168.253.168   192.168.11.169    ICMP      Echo (ping) reques
```

```
⊞ Frame 1 (74 bytes on wire, 74 bytes captured)
⊞ Ethernet II, Src: Intel_01:01:01 (00:02:b3:01:01:01), Dst: Ibm_c9:b0:8a (00:0d:60:c9:b0:
⊞ Internet Protocol, Src: 192.168.253.168 (192.168.253.168), Dst: 192.168.11.169 (192.168.
```

```
0000  00 0d 60 c9 b0 8a 00 02  b3 01 01 01 08 00 45 00   ..`..... ......E.
0010  00 3c 3c 18 00 00 7f 01  75 06 c0 a8 fd a8 c0 a8   .<<..... u.......
0020  0b a9 08 00 7e 28 05 00  ca 33 61 62 63 64 65 66   ....~(.. .3abcdef
0030  67 68 69 6a 6b 6c 6d 6e  6f 70 71 72 73 74 75 76   ghijklmn opqrstuv
0040  77 61 62 63 64 65 66 67  68 69                     wabcdefg hi
```

rpcap://192.168.253.165/lan-out: <live capture in progress> File: C:\DO... Packets: 126 Displayed: 126 Marked: 0 Profile: Default


rpcap://192.168.253.165/lan-out: Capturing - Wireshark
File Edit View Go Capture Analyze Statistics Help
Expression... Clear Apply

Filter: ip.src==192.168.253.168

```
No. -   Time        Source            Destination      Protocol  Info
    547 253.453256  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    549 254.442089  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    554 256.422738  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    556 257.411618  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    558 258.402430  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    560 259.392197  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    562 260.381276  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    564 261.371034  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    566 262.360856  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    568 263.351522  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    572 264.344322  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    574 265.334547  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    576 266.320306  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    578 267.310098  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    580 268.299900  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    582 269.290707  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
    586 270.280579  192.168.253.168   192.168.11.169   ICMP      Echo (ping) reques
```

```
⊞ Frame 1 (74 bytes on wire, 74 bytes captured)
⊞ Ethernet II, Src: Intel_01:01:01 (00:02:b3:01:01:01), Dst: Ibm_c9:b0:8a (00:0d:60:c9:b0:
⊞ Internet Protocol, Src: 192.168.253.168 (192.168.253.168), Dst: 192.168.11.169 (192.168.1
```

```
0000  00 0d 60 c9 b0 8a 00 02  b3 01 01 01 08 00 45 00   ..`..... ......E.
0010  00 3c 3c 18 00 00 7f 01  75 06 c0 a8 fd a8 c0 a8   .<<..... u.......
0020  0b a9 08 00 7e 28 05 00  ca 33 61 62 63 64 65 66   ....~(.. .3abcdef
0030  67 68 69 6a 6b 6c 6d 6e  6f 70 71 72 73 74 75 76   ghijklmn opqrstuv
0040  77 61 62 63 64 65 66 67  68 69                     wabcdefg hi
```

rpcap://192.168.253.165/lan-out: <live capture in progress> File: C:\DO...

Packets: 587 Displayed: 274 Marked: 0

Profile: Default

➔

Note:

If the Windows firewall is activated, it is not sufficient to unlock the Port 2002 because, like with FTP, a separate data connection with any of the port numbers is used. The ads-tec device on which the Remote Capture Service runs does not need specific filter settings.

WIRESHARK ERROR MESSAGES

If the connection build-up fails, Wireshark shows a window with the message „The capture session could not be initiated" indicating the precise grounds in brackets. The most frequent grounds will be explained below:

ioctl: No such device

The indicated interface does not exist. Either the spelling is wrong (see the above table), the device is differently configured or the interface is temporarily not available. (e.g. the DSL interface only exists with the existing uplink).

Is the server properly installed on <IPADDRESS>? Connect () failed: ...

The indicated IP address <IPADDRESS> is not available or the Remote Capture Service does not run there.

The host is not in the allowed host list. Connection refused.

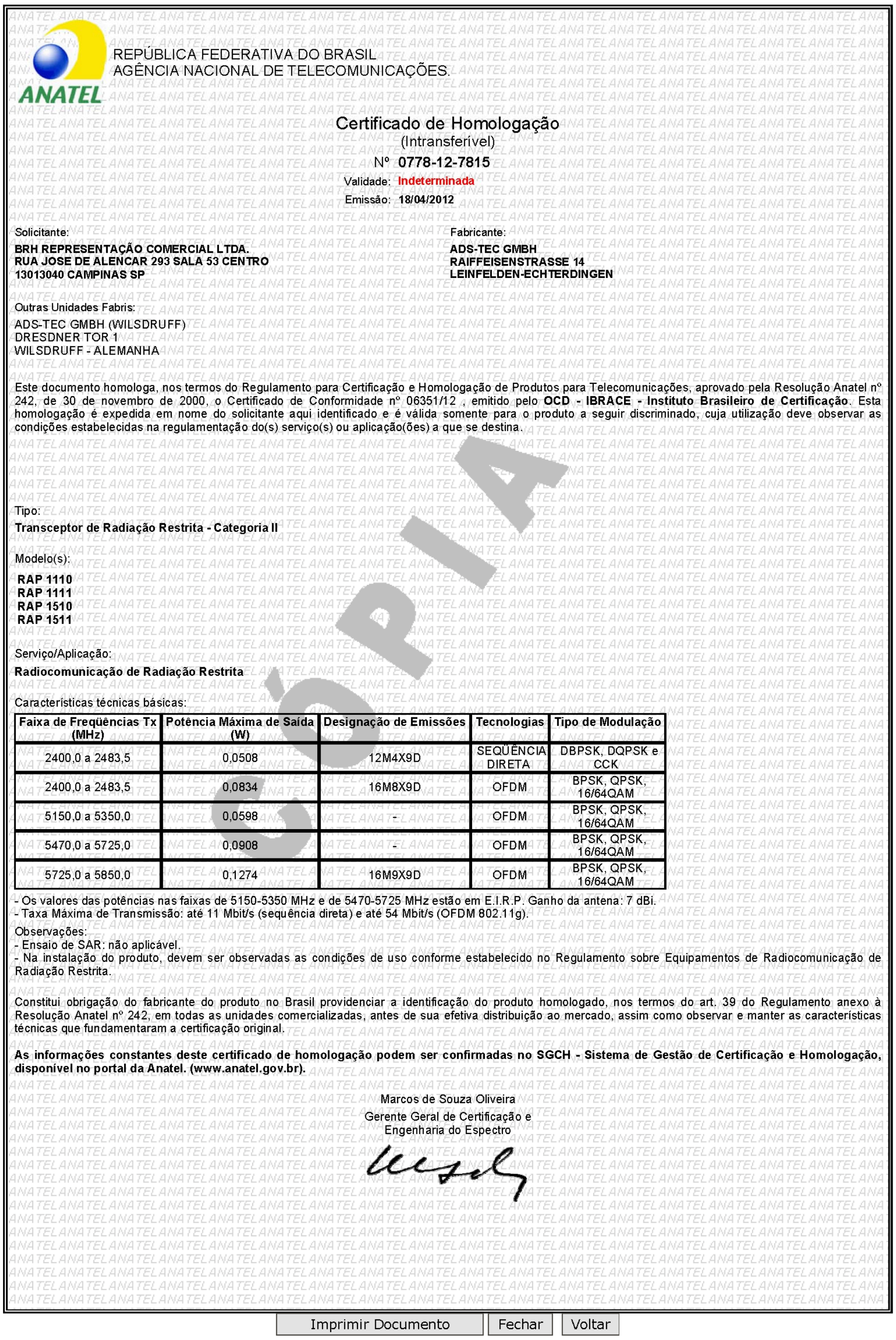
The IP address of the own computer does not correspond to that permitted in the web interface of the device (causing an entry in the Event Log of the device).

Too many clients

There is already a connection to the Remote Capture Server. Either by another Wireshark application or another network user with falsely identical IP address (causing an entry in the Event Log of the device).

12.1 Certification Brasil

Certificate



REPÚBLICA FEDERATIVA DO BRASIL
AGÊNCIA NACIONAL DE TELECOMUNICAÇÕES

Certificado de Homologação
(Intransferível)
Nº 0778-12-7815
Validade: **Indeterminada**
Emissão: **18/04/2012**

Solicitante:
BRH REPRESENTAÇÃO COMERCIAL LTDA.
RUA JOSE DE ALENCAR 293 SALA 53 CENTRO
13013040 CAMPINAS SP

Fabricante:
ADS-TEC GMBH
RAIFFEISENSTRASSE 14
LEINFELDEN-ECHTERDINGEN

Outras Unidades Fabris:
ADS-TEC GMBH (WILSDRUFF)
DRESDNER TOR 1
WILSDRUFF - ALEMANHA

Este documento homologa, nos termos do Regulamento para Certificação e Homologação de Produtos para Telecomunicações, aprovado pela Resolução Anatel nº 242, de 30 de novembro de 2000, o Certificado de Conformidade nº 06351/12 , emitido pelo **OCD - IBRACE - Instituto Brasileiro de Certificação**. Esta homologação é expedida em nome do solicitante aqui identificado e é válida somente para o produto a seguir discriminado, cuja utilização deve observar as condições estabelecidas na regulamentação do(s) serviço(s) ou aplicação(ões) a que se destina.

Tipo:
Transceptor de Radiação Restrita - Categoria II

Modelo(s):
RAP 1110
RAP 1111
RAP 1510
RAP 1511

Serviço/Aplicação:
Radiocomunicação de Radiação Restrita

Características técnicas básicas:

Faixa de Freqüências Tx (MHz)	Potência Máxima de Saída (W)	Designação de Emissões	Tecnologias	Tipo de Modulação
2400,0 a 2483,5	0,0508	12M4X9D	SEQÜÊNCIA DIRETA	DBPSK, DQPSK e CCK
2400,0 a 2483,5	0,0834	16M8X9D	OFDM	BPSK, QPSK, 16/64QAM
5150,0 a 5350,0	0,0598	-	OFDM	BPSK, QPSK, 16/64QAM
5470,0 a 5725,0	0,0908	-	OFDM	BPSK, QPSK, 16/64QAM
5725,0 a 5850,0	0,1274	16M9X9D	OFDM	BPSK, QPSK, 16/64QAM

- Os valores das potências nas faixas de 5150-5350 MHz e de 5470-5725 MHz estão em E.I.R.P. Ganho da antena: 7 dBi.
- Taxa Máxima de Transmissão: até 11 Mbit/s (sequência direta) e até 54 Mbit/s (OFDM 802.11g).

Observações:
- Ensaio de SAR: não aplicável.
- Na instalação do produto, devem ser observadas as condições de uso conforme estabelecido no Regulamento sobre Equipamentos de Radiocomunicação de Radiação Restrita.

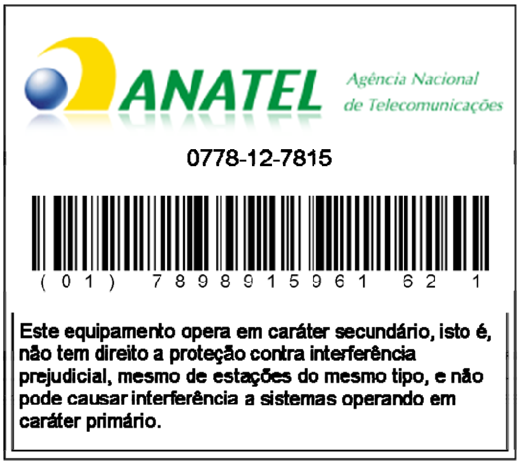
Constitui obrigação do fabricante do produto no Brasil providenciar a identificação do produto homologado, nos termos do art. 39 do Regulamento anexo à Resolução Anatel nº 242, em todas as unidades comercializadas, antes de sua efetiva distribuição ao mercado, assim como observar e manter as características técnicas que fundamentaram a certificação original.

As informações constantes deste certificado de homologação podem ser confirmadas no SGCH - Sistema de Gestão de Certificação e Homologação, disponível no portal da Anatel. (www.anatel.gov.br).

Marcos de Souza Oliveira
Gerente Geral de Certificação e
Engenharia do Espectro

ANATEL LABELS

RAP1110-103-BU



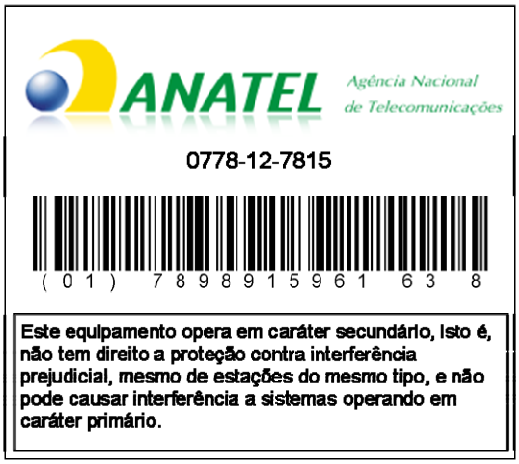
ANATEL Agência Nacional de Telecomunicações

0778-12-7815

(01) 7898915961 62 1

Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.

RAP1111-102-BU



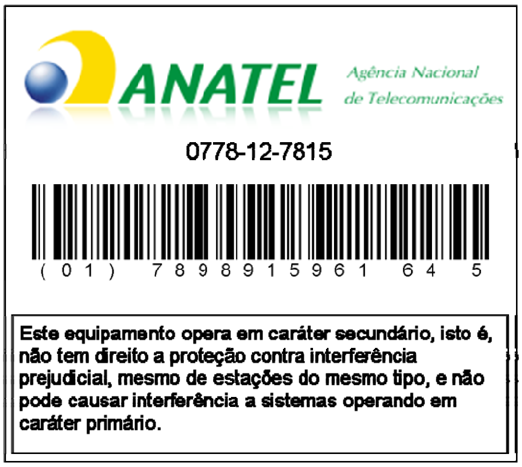
ANATEL Agência Nacional de Telecomunicações

0778-12-7815

(01) 7898915961 63 8

Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.

RAP1510-101-BU



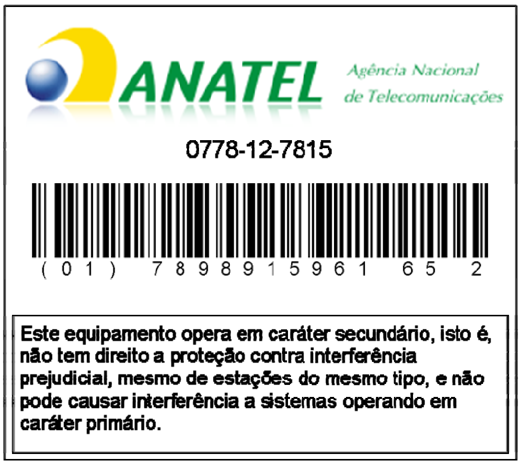
ANATEL Agência Nacional de Telecomunicações

0778-12-7815

(01) 7898915961 64 5

Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.

RAP1511-101-BU



ANATEL Agência Nacional de Telecomunicações

0778-12-7815

(01) 7898915961 65 2

Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.